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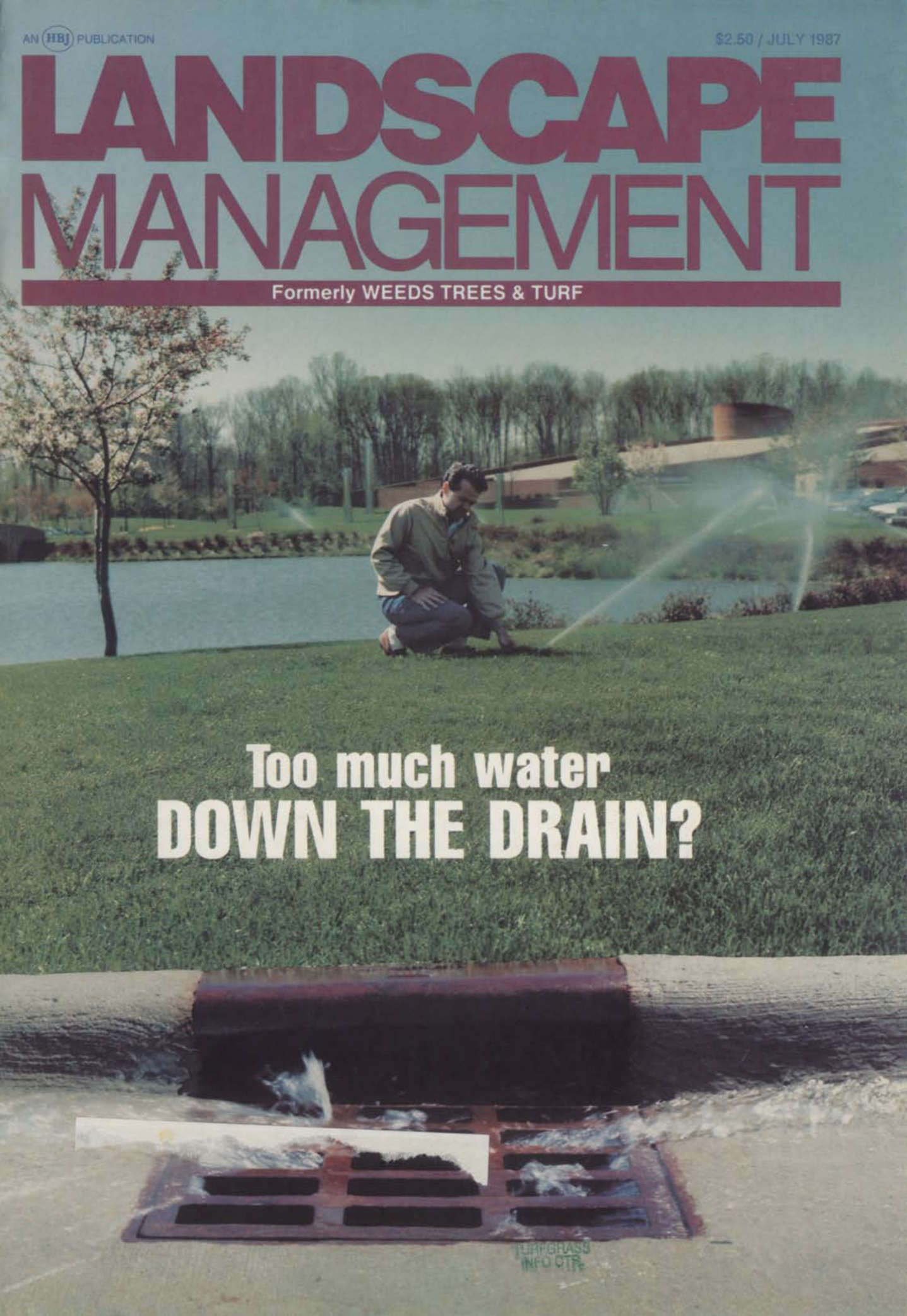

Too much water DOWN THE DRAIN?

TURFGRASS INFO CTR.

Penneagle crowds out bluegrasses on Butler National's fairways

Triplex fairway mowing at The Butler National Golf Club, Oak Brook, IL

When Oscar Miles, CGCS, of The Butler National Golf Club, introduced Penneagle creeping bentgrass into his Poa annua infested A-20 bluegrass fairways in 1980, he took a dynamic step toward the beautiful fairways praised by the pros during the Western Open.

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JULY 1987, VOLUME 26, NUMBER 7

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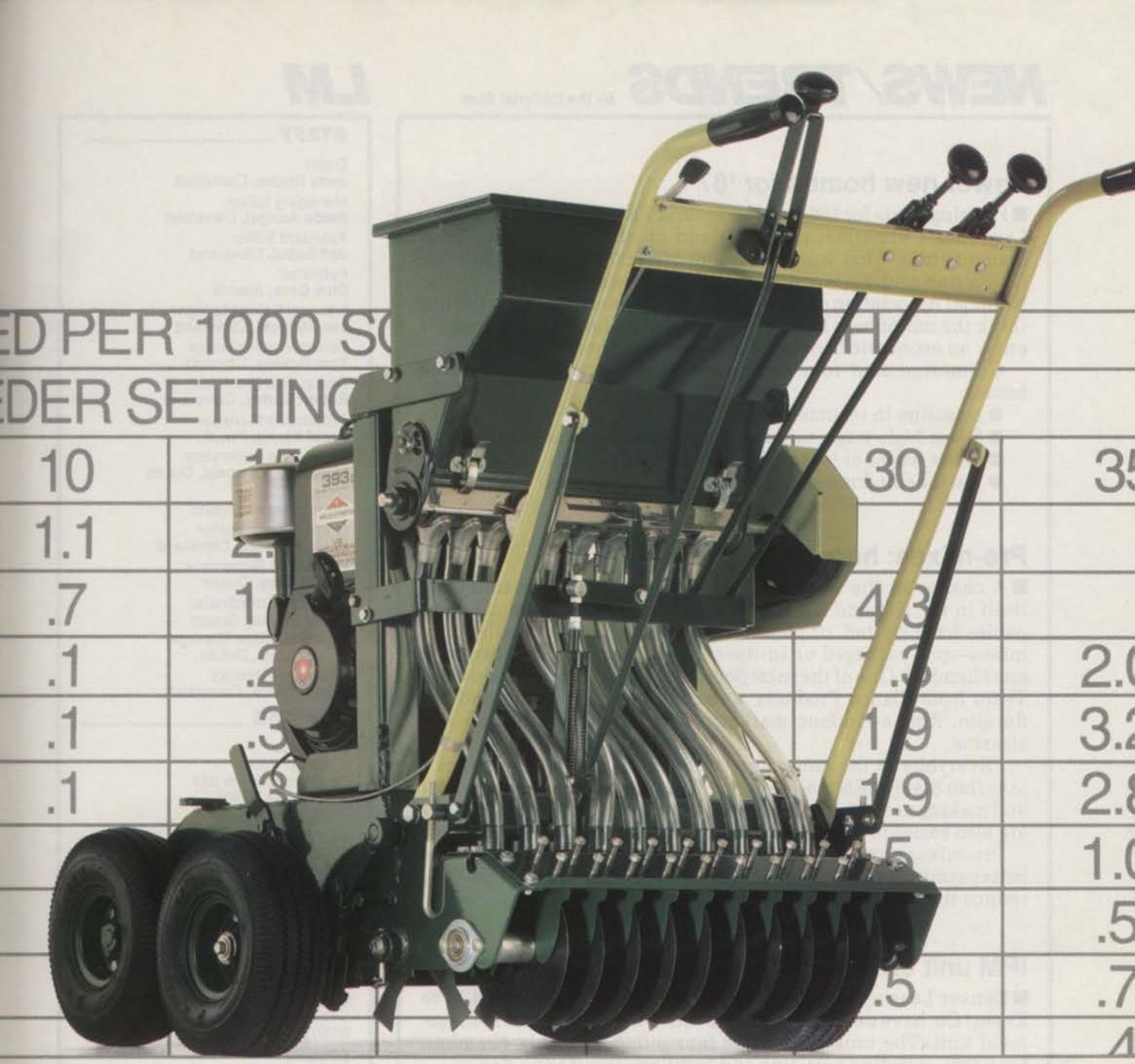

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NEWS/TRENDS by the Editorial Staff

Fewer new homes for '87

■ Housing starts for 1987 will be around 1.65 million, according to Lawrence Chimerine, chairman and chief economist at Chase Econometrics. That would be about 200,000 fewer than in 1986, Chimerine said. He was speaking at a media seminar held by the National Association of Home Builders. Chimerine said he did not think the nation was headed for a recession, but neither would it enjoy an economic boom in the next one to three years.

Chimerine said four things are slowing purchases of new homes:

- a decline in incomes;
- fewer high-wage, middle-income jobs like steel-working;
- lower wages of jobs in the service industry like Burger King;
- the indebtedness of many families.

Pre-mixes: here to stay?

■ A change in the way pesticides are marketed is manifesting itself in the golf and landscape industries. Many chemical companies have started, or plan to start, selling products called pre-mixes—pre-packaged or in-the-can combinations of more than one chemical. One of the most popular herbicides on the market is Team from Elanco Products, a combination of benefin and trifluralin. Rhone-Poulenc markets a combination of buctril and atrazine.

"Everyone in the landscape market is looking at pre-mixes," says Dan Stahl of Rhone-Poulenc. "The trend is toward lower cost and making use of generic materials, and pre-mixes are that. They are also easier to get on the market."

Pre-mixes provide the landscape manager with broader and/or better control; they eliminate possible mixing errors; and they reduce the number of containers to be disposed.

IPM unit created

■ Denver Leasing and Manufacturing and the F.A. Bartlett Tree Expert Co. have developed an innovative integrated pest management unit. The unit is a unique four-pump, four-mix chamber, four-reel, selective pesticide and fertilizer application device.

"This unit not only complies with federal and state regulations, but also provides the user with the latest technology in pesticide application," says Bob Smith of Denver Leasing.

The main tank carries only water. The operator mixes chemicals in any of the four chambers, and can select the appropriate strength and quantity for each particular situation. Quantities delivered can be from one ounce to 150 gallons.

For information, call Smith at (303) 422-7608 or write him at 6945 Indiana Ct., Golden, CO 80403.

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LANDSCAPING

Company installs sky-high plants in Houston

The Spencer Company, Houston, took its landscaping skills "to new heights" when it installed rooftop terraced gardens on the 48th through 51st floors of the Gulf Tower building in downtown Houston.

The extreme height of the project—police helicopters whiz by several feet from the gardens—presented some unique problems. Like winds regularly reaching gusts of 50 miles per hour.

Spencer installed plants able to withstand such conditions. Where possible, they have been positioned near walls and other natural windbreaks. The plants are watered by an automatic irrigation system under the supervision of a Spencer Company horticulturist.

The four terrace levels range in length from 25 to 150 feet. Each gets successively longer toward the top floor. Symmetrical plantings include borders of mondograss and plantings of nandina and dwarf yaupon.

Plants are positioned near natural wind-breaks at the Gulf Tower Building.

Perched nearly 500 feet above street level, these terrace gardens are probably the loftiest landscape projects in the city.

The Gulf Tower Building is operated by Chevron Companies.

BUSINESS MANAGEMENT

To lease or not to lease? That is the question. . .

Leasing used to be the right to use something for a specific period of time, after which you'd return it. But today, leasing can imply ownership.

With such little difference between leasing and buying, how do you make the decision? You look at the cashflow level of your business, says Fernando Bensuaski of Bensuaski, Delana & Luce in Boise, Idaho.

"The idea of leasing only makes sense to small businesses, if the cash outlay improves," Bensuaski says. With both leasing and buying, the purchaser usually has to pay maintenance costs, interest and depreciation of the equipment. When the differences between leasing or buying are broken down, the only real difference is the down payment which is needed in buying. Although some leases will cover maintenance, the purchaser still ends up paying in the way of depreciation."

Bensuaski says that before making a decision, a person should ask these questions:

● *Should we have the equipment at all?* Small businesses often embark on a decision without clearly thinking through this point.

● *Can we afford it?* New equipment should pay for itself. Seek out the advice of a good accountant and banker.

● *Can we budget to pay for the equipment?* Landscaping is seasonal, which makes it difficult to make payments some months.

Bensuaski

"The odds are worse than at a slot machine in Las Vegas," Bensuaski says. "In Las Vegas, you don't have to contend with rain and early snow."

● *Are we creating too much leverage?* Fast growth of a company can create a large debt. If things suddenly slow down, the company could go broke.

Good cash management is the key to a successful business. "A lot of people confuse cash with profit," he says. "It's not the same thing. You can have a very profitable company, but be broke because it's all tied up in equipment or worse, you tie it up in receivables."

CONFERENCES

OPEI Expo will 'go international' later this month

Attendees and exhibitors at the International Lawn Garden & Power Equipment Expo '87 can expect a larger international contingent than last year when delegates from 37 countries attended the show.

According to Basilio Liacuris, director of international programs, pre-registration indicates a strong showing from Canada, with a number of European countries close behind. Government representatives from England, Italy and Venezuela will also attend the show, being held in Louisville, Ky., July 27-29.

Liacuris attributes the expected international attendance increase to more support from exhibitors through promotional mailings, Expo advertisements appearing in 171 countries and a greater awareness of the event, now in its fourth year.

The show floor for the Expo, sponsored by the Outdoor Power Equipment Institute, will be expanded to 260,000 sq. ft. this year.

PESTICIDES

No evidence linking 2,4-D with human cancer, EPA says

The U.S. Environmental Protection Agency has yet to see evidence linking the herbicide 2,4-D to human cancer. It has tentatively given the compound a Category C classification.

The classification means the compound is a "possible human carcinogen with limited evidence of carcinogenicity in animals," says Doug McKinney, who was the EPA's special review manager for 2,4-D at the time the classification was announced.

The classification was made after the EPA's 2,4-D peer review panel completed a literature survey for 2,4-D.

A category A classification would mean the compound is a human carcinogen. Category B would mean there is cause for concern of carcinogenicity.

Category C means there is some possibility of animal carcinogencity, McKinney said, but the data is inconclusive.

The review panel's work will be examined by the EPA's Scientific Advisory Panel, according to McKinney. That panel will either agree with the review panel or ask for more information. The advisory panel was scheduled to meet June 25.

A Canadian panel, meanwhile, concluded there is no conclusive data linking 2,4-D to cancer in humans or animals. The Expert Panel Report on Carcinogenicity of 2,4-D, dated March 23, prompted the Ontario Ministry of the Environment to remove a moratorium on the introduction and use of new 2,4-D products.

"Overall, the panel concludes that the existing animal and human data are insufficient to support the finding that 2,4-D is a carcinogen and, consequently, finds insufficient evidence to conclude that existing uses of 2,4-D in Ontario pose a human health risk," states the report.

"I think they've done a pretty good job trying to review all the studies," notes Greg Richards, chemical products manager for Lesco, Inc., Rocky River, Ohio. "It doesn't seem to be all politically motivated."

Even if the EPA does change the product's user status at some time in the future, Richards said, "At least this (scientific approach) gives us some more time to develop other products that can do the job of 2,4-D."

"As time has gone, their (the EPA's) actions in this manner have gone along in a careful pace," said Dr. Wendell Mullison, consultant to the Dow Chemical Co. "The fact that they're doing this is very optimistic."

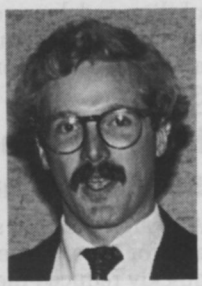
—Elliot Maras

BUSINESS MANAGEMENT

Drugs and other problems

It's a subject that's received widespread publicity. It's an emotional and controversial topic. But testing employees for drugs is necessary, says attorney Richard Lehr.

Operating mowers and other equipment is as dangerous as driving under the influence. "Do you want to wait for an accident?" Lehr asks. "You are strictly liable for the acts of your employees."



Lehr

Besides drug testing, Lehr advocates thoroughly checking out an employee before making a hiring decision. Check the applicant's safety record, driving record and absenteeism. In the interview, ask applicants what they liked and disliked about their past supervisor. "A problem with an employee in the first year is a hiring mistake," Lehr says. "In the second year, it's a management mistake."

Lehr warns that another management mistake is using disclaimers. A disclaimer is a statement in a contract which says that the company is not responsible for certain mishaps.

"Disclaimers are not favored by the courts and are viewed against the writer of it—you," Lehr says.

Making promises or guarantees in advertising or contracts is also viewed against the company. "If you're using the term 'guarantee', you may create a warranty," Lehr says.

1-2-3

While we may take precautions to prevent accidental poisoning from pesticides, we are often unprepared when such an occasion arises. It is critical to be prepared, especially since a life could be at stake. Remember these procedures. It could save a life.

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2. Immediately call a poison control center or doctor.

3. Remove contaminated clothing, wash skin, hair and fingernails with soapy warm water, dry and and keep the victim warm.

4. If the pesticide has gotten into an eye, gently rinse with clear running water quickly, continuing for at least 15 minutes.

5. If pesticides have been inhaled, *carry* the victim to fresh air and keep calm, in the event of convulsions, watch victim's breathing and protect the head from injury. Keep the chin up to keep air passages free.

6. If the pesticide is swallowed, induce vomiting in *conscious* victims. If unconscious, showing signs of convulsions or has swallowed petroleum or other corrosives, do *not* induce vomiting. The blunt end of a spoon, two tablespoons of salt in water or syrup of ipecac will induce vomiting. To keep vomitus out of the lungs, have the victim face-down with head lowered. If the victim can swallow after ingesting a corrosive poison, give as much milk or water as can be tolerated.

7. Take the victim to a hospital as quickly as possible.

8. Give the container and remaining to the doctor. If this can't be done, give him a sample of the vomitus.

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INDUSTRY

Imperial agrees to buy Stauffer

Imperial Chemical Industries says it has agreed to purchase Stauffer Chemical Co. from Unilever for $1.69 billion in cash. Unilever acquired Stauffer just last year when it purchased Chesebrough-Ponds.

ICI's primary interest is in Stauffer's agrochemical operations, which accounted for half of the company's $1.3 billion in sales and $113 million in pre-tax profit in 1986.

According to Ray King, who handles investor relations for ICI, the company "has been approached by several entities" interested in purchasing Stauffer's specialty and basic chemical operations, which ICI plans to sell, but "we don't feel constrained to sell."

According to Stauffer's Greg Bushman, the Stauffer-ICI deal was due to close on July 9.

King says the company will evaluate Stauffer's operations and management in the coming months, but as yet it is too early to tell if any changes will be made at Stauffer.

Unilever will use money from the Stauffer sale to pay back some of the debt from the Chesebrough purchase.

CHEMICALS

Sandoz names new pre-emergence herbicide

Sandoz Plant Protection Corp. has named its new pre-emergence herbicide Blockade. The herbicide was developed for use on turf and ornamentals.

University trials and Experimental Use Permit (EUP) demonstrations for the herbicide, technically known as prodiamide, showed it to provide long residual control of common turf weeds.

Scheduled for release in 1988, Blockade has a limited water solubility and low volatility. This year the herbicide will undergo further trials and EUP demonstrations.

SEED

High demand hits seed crop hard

Although the 1986 seed crop was average for most varieties, high demand quickly reduced the nationwide supply of turfseed. Jerry Pepin, Ph.D., of Pickseed West predicts the '87 crop will only be slightly better for most varieties.

"The demand for turfgrass has sky-

continued on page 12

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SEED CROP *from page 8*

rocketed," Pepin says. The high demand and low supply forces seed prices up. "When the '87 crop comes in, hopefully it will be a better situation and mean lower prices."

Pepin's predictions include:

- limited availability of Kentucky bluegrass;
- fair availability of fine fescue;
- fair availability of perennial ryegrass;
- fair to good availability of turf-type tall fescue; and
- fair to poor availability of creeping bentgrass.

Although more creeping bent is being grown than in the past, the demand is much higher. "More golf courses are using creeping bent in their fairways and more Southern states are using it than ever before," Pepin says.

Pepin spoke at the Reinders Turf Conference in Milwaukee, Wisc.

TURF

Proper soil testing procedures are an art

Soil tests should be done at the same time each year, according to Dale Kinney of Harris Labs. That way, testing history can be charted for trends in the turf area.

Kinney says the size of the sample depends on the type of area that you are testing. Kinney says to avoid non-representative areas when picking a sample.

Soil tests are necessary to determine nutrient levels, soil characteristics and problems. Collect samples with a stainless steel probe in a plastic pail. Always remove the thatch layer.

- To sample greens, Kinney recommends taking 10 to 12 cores up to three inches deep.
- For fairways, send 10 to 15 cores up to three inches deep.
- For rights-of ways or park areas, send 15 to 30 cores up to six inches deep.
- For lawns, send 10 to 15 cores up to three inches deep.
- For shrub and hedge areas, send 10 to 15 cores up to six inches deep.

Kinney says to always know the laboratory procedures and methods being used.

Kinney spoke at the Reinders Turf Conference in Milwaukee, Wisc.

TREES

Nicks and salt are bane of urban trees

The way to keep trees healthy is to avoid extremes, but that's impossible in a city atmosphere. The Morton Arboretum in Chicago is researching ways to make trees more adaptable to urban settings.

George Ware, Ph.D., dendrologist at the arboretum, says trees need to be selected to tolerate urban stress. Beyond that, certain cultural practices can help.

Ware recommends relieving "people pressure" by placing barriers around the trees. Mulching helps by keeping lawn mowers away from the tree's trunk.

"One nick on a two-inch tree will be with the tree for life and will shorten its life," Ware says. "For a young tree a nick is a large part of the circumference."

Another major problem with urban trees is the salt spread on expressways which gets splashed on trees and soil. Salt-tolerant trees, such as the hackberry, must be chosen.

Trees should be inspected to make sure the trunk isn't being wasted under the soil. Roots need room to grow freely. "We suggest digging trenches to allow space for roots to grow," Ware says.

continued on page 14

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TURF TYPE TALL FESCUE

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INDUSTRY NEWS *from page 12*

Imitating forest conditions helps urban trees. "Whoever heard of grass in a forest?" Ware asks. Most trees aren't used to living in turf.

Looking at the overall landscape situation should be a priority. Trees should be native to the region or to a part of the world with a similar climate.

Ware spoke at the Landscape Expo in Chicago, Ill.

ASSOCIATIONS

Breeders group formed to help seed growers

The Turfgrass Breeders Association has been formed to collect and distribute breeding data to educate growers and distributors on plant variety protection (PVP) laws. The group also intends to police PVP infractions.

"Our membership is the 'Who's Who' of the turfgrass breeding industry," says John Rutkai, association president. "With names like Dr. Jerry Pepin, Dr. Reed Funk and Dr. Bill Meyer, we have established credibility and clout.

"PVP laws were intended to protect and reward developers of improved turfgrass varieties," Rutkai adds. "Some sellers could be bypassing the certification and/or royalty programs."

For a better seed industry: left to right, Dr. Jerry Pepin, John Rutkai and Dr. Bill Meyer.

One of the first projects the association will be to investigate is variety-not-stated (VNS) perennial ryegrass trading. The association will act as a fact-finder, investigating suspect seed and presenting conclusions. It will be up to the individual breeder to prosecute infringements.

One goal of the association is to develop and implement a system to "fingerprint" turfgrass seeds so that a sample drawn from a suspect source will reveal the actual variety.

"The protection of improved varieties through the Plant Variety Protection Act was a giant step in turf breeding," Rutkai notes. "Now we want to put teeth into the law."

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COVER STORY

...TO THE LAST DROP

A diminishing water supply is forcing the green industry to take a hard look at conservation and alternative sources of water for irrigation.

by Jeff Sobul, assistant editor

Water. It is a resource we have long taken for granted. But like the Great Plains buffalo in the 19th century, it is one we can also drive to near-extinction.

Though 70 percent of this planet's surface is covered by water, only one percent of that water is fresh and usable.

Groundwater, our hidden resource, is a major contributor to our water supply. But humans syphon an average of 82 billion gallons of water each day from groundwater, only 61 billion of which is replaced through rainfall and runoff.

We put increasing demands on water resources as the United States modernized this century, and demands will continue to increase into the next.

STOPPING GLUTTONY

The most obvious way to avoid waste is through water management. Millions of gallons can be saved just by adjusting irrigation practices to maximize water efficiency without changing the landscape.

To begin with, stop watering sidewalks, driveways and parking lots by adjusting sprinkler heads.

A Landscape manager must know the water needs of the turf or plant material. Overwatering is common. "By far," says Suzanne Butterfield of the California Department of Water Resources, "landscape plants suffer more from overwatering than from underwatering."

Knowing evapotranspiration (ET) rates (the amount of moisture which is returned to the atmosphere via evaporation from the soil and transpiration through plant leaves) will give the precise amount of irrigation needed, expressed in inches.

The Water Conservation Office of the Denver Water Department, upon request, provides a simple device for converting inches of irrigation into time. Denver's Water Office also announces the ET rate daily. Check local papers or water department offices for ET rates in specific areas.

Increase water efficiency further by adjusting the time when irrigation is done. If it's sunny, 85 degrees with a breeze and the sprinkler system is on, as much water is probably evaporating as is reaching the roots of the turf. Irrigate when the chance of evaporation is at its lowest. "Water between midnight and 10 a.m.," instructs Mike Agnew, Ph.D., of Iowa State University.

"Because of past drought, we only run our water system between 4 p.m. and 10 a.m., with most starts between 10 p.m. and 12 a.m.," says Gary Tollison, highway landscape supervisor for District 7 in California. With less chance for evaporation at this time, more water reaches the plant root zone where it does the most good.

Agnew also recommends deep and infrequent watering. In heavier soil, though, he says "a gradual soaking in short periods is more effective."

Water management also includes finding and developing new sources of water for irrigation. Most of the country's aquifers and surface water supplies are already known. Therefore, developing new sources of water is becoming necessary.

The most promising new source is really an old one: effluent or reclaimed water. The water is recycled, filtered so it can be re-used. Applications so far are limited mostly to golf courses, though this will soon expand. Effluent use is only in its infancy, but a rapid maturation is in the offing.

Researchers say that certain cultural practices will help turf conserve water naturally. The key, says Virgina Tech's John Hall III, Ph.D., is to "maximize root development."

The deeper root system provides more water-drawing potential for the plant. Hall emphasizes using late fall fertalization. At this time, the plant's energies are focused more on root development than shoot development so the nitrogen will work more on that end of the plant. Higher potassium rates are also beneficial, he notes.

Mowing heights can also be adjusted for optimum root devlopment and water efficiency. A higher mowing height helps root devlopment, though height restrictions can come into play on golf courses. There is, of course, a trade-off. The longer leaf blades use more water. Hall says that to keep the use rate constant increase mowing frequency, for home lawns perhaps from once to twice a week.

Thatch is another area of concern. "Thatch is an inefficient water holder," Hall says. Spring aeration and coring prior to periods of limited rainfall, Hall notes, will maximize infiltration.

A SPLASH IN THE FACE

Effective water management will invariably have to go beyond simple adjustment of cultural and irrigation practices. One key will be public education, notes Gene Williamson, superintendent of parks for the North Jeffco Metropolitan Recreation and Park District Parks Department, Arvada, Colo.

Williamson's department has been meeting with citizens and homeowner associations to convince them that low-water landscapes such as xeriscapes (see story page 29) are beneficial. But, Williamson says, "they want nothing but bluegrass in the parks. And that's costing us money. We tell them the grass might not look quite as good, but it's just as healthy."

Waking up a doubting public to the present and future water situation in Denver's semi-arid climate has been difficult at best for the parks people. Williamson notes that when a park planning meeting with a homeowner group occurs, "we ask them what they want, we tell them what they need, and then we compromise."

For now, his district has reduced watering where it can, implemented isolated xeriscapes—low turf, water efficient landscapes—and experimented with more drought-resistant turfgrasses.

Extensive research is being con-

ducted to determine and breed more drought-tolerant and drought-avoidant turfgrass varieties.

"Drought avoidance is actually more important than drought tolerance," says Robert Shearman, Ph.D., of the University of Nebraska. "The plant just doesn't wilt. It avoids wilt symptoms."

Turfgrasses of this variety "maintain adequate water potential with low use rate or get water from the soil better," Shearman says. He adds that Adventure and Mustang tall fescues are the best examples of turf that combine both drought tolerance and wilt avoidance.

Plant breeder Terry Riordan, Ph.D., works with Shearman. He is trying to breed the most water-frugal and hearty plants. One grass variety Riordan is working with is buffalograss, a warm season variety native to the Great Plains. "This (buffalograss) is the area we're most optimistic about now," he notes. "It already has a lot of good characteristics."

Riordan's research project to find low water-use grasses is in the third year of a seven-year project funded by the USGA and GCSAA. Through his work, he has made some major improvements in the buffalo species. The biggest improvement has been in germination time. "A buffalograss burr (which holds the seed) normally requires a year to germinate. We've got that down to three days," he says.

Perhaps the biggest strike against buffalograss in cool-season climates is its dormancy. "Most people don't want the dormant tan color for five to six months of the year," notes Dorothy Borland of The Turf Expert, Denver.

But Riordan sees buffalograss being used in golf course roughs, industrial sites, roadsides and even home lawns. He notes that a couple of lower budget golf courses in Nebraska are actually using buffalograss on fairways.

Another problem with buffalograss is that it is "not very competitive with cool-season grasses" like blue or rye, Riordan explains. However, he says, "applications of simazine at normal rates keep cool-season grasses at bay so buffalograss can propagate."

Riordan believes buffalograss will be able to adapt to the heavier soils of the Southwest, though Florida soils could be a problem because they are rather sandy. In all, he concludes, "I think we've made significant progress."

Further benefit can be gained by implementing native shrubs and trees into the landscape instead of import-

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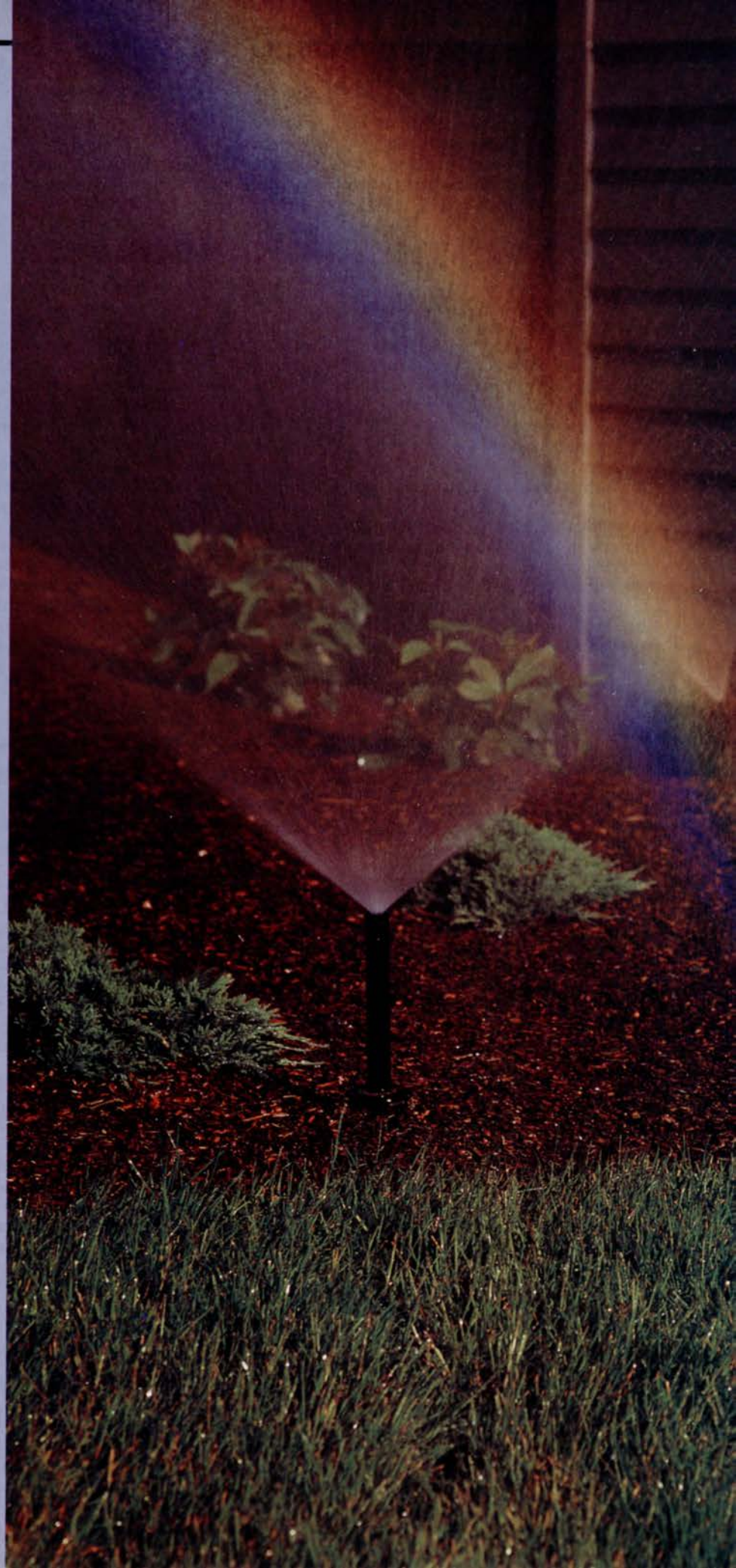

. . . TO THE LAST DROP *from page 19*

ing less adaptive breeds. Natives tend to require less water after establishment and grow well in local soils. "Natives are emphasized in xeriscaping," notes Cyrus McKell, Ph.D., of Native Plants, Inc., a plant biotechnology firm. He recommends also selecting plants with greater stress tolerance.

According to LANDSCAPE MANAGEMENT research, nearly 52 percent of the magazine's readers are engaged in some form of irrigation. In 1986, readers spent over $101 million on irrigation equipment, $59 million on sprinklers alone.

Expenditures on electronic irrigation controls increased more than $5 million from 1984 figures, to $20.8 million.

"Irrigation will become more computerized and automatic," comments Steve Bock, an assistant golf course superintendent in Papillion, Neb.

"One (advancement) would probably be a control box that could be placed in the office," adds Gregg Wilson, co-owner of Southern Turf, a landscaping/lawn maintenance firm in Goldsboro, N.C. "With it, all systems could be programmed or controlled. This would discontinue any hustling to a site in case of rain during the time set for irrigating."

CHANGING TIMES

"The computer is really the thing that's going to change the irrigation industry," says Vince Nolletti of Buckner, Inc. Adds Tom Fermanian, Ph.D. of the University of Illinois, "Over the next 20 years they will be widely accepted in the industry."

Much of the technology needed for efficient systems exists already, and some of it is not new at all. Computers already run irrigation systems.

Computers can make use of the latest technology that reads the environment. Golf courses can now have weather stations installed as part of irrigation systems. Weather stations monitor atmospheric and ground moisture conditions to determine the evapotranspiration (ET) rate and adjust irrigation rates and timing accordingly (see sidebar below).

Included in weather stations are tensiometers, instruments measuring soil moisture content. Palm Springs, Calif., recently experimented with tensiometers. According to Ronald L. Baetz of the Desert Water Agency, the city took a 6½-acre park served from two irrigation meters, divided it in half and installed tensiometers in one half. For the two-year life of the project, water use was cut by 54 percent on the fitted half, translating into a savings of $11,000, just for that one small area. Not surprisingly, "the city is following a program to retro-fit most of its landscaping with tensiometers," Baetz says.

Edward Hunter of Hunter Industries sees low-cost plastic rotors replacing the fixed heads used today. To use tensiometers effectively, sprinklers must "apply evenly and at an acceptable rate. Most apply too fast for absorption," Hunter says, about 1½ to 2 inches per hour.

These new heads are likely to oper-

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More 'eyes' for turf managers

New irrigation equipment can help turf managers save water, a resource that is becoming increasingly valuable. However, further technical evolution is needed; landscape managers can never have enough "eyes" to help them monitor water usage.

Irrigation manufacturers are taking a hint from these signs of the times by trying to develop sophisticated yet easy-to-use equipment. Not often in irrigation industry have manufacturers generally agreed on marketing plans, but in this instance they do.

Rain Bird Sales of Glendora, Calif., has devised a complete irrigation system which can include weather stations that can calculate probable daily evapotranspiration loss and automatically set the controller so that the correct amount of water can be put back into the turf. The system is called the Maxi ET.

But just because it's almost fully automated, the Maxi ET does not waste the landscape manager's expertise.

"He is the expert," notes Rene Evelyn-Veere of Rain Bird. "The Maxi first draws on his experience because the superintendent or landscape manager can modify the weather station data for specific weather conditions. Then, once the turf manager gets 'tuned into' the system, he can slowly, more precisely replace the water."

The weather station, placed centrally on a golf course for instance, senses temperature, solar radiation, relative humidity and wind speed to calculate the water lost to evapotranspiration over 24 hours. It then subtracts rainfall during the period and, through an IBM PC computer, adjusts irrigation to replace the lost water.

"The user defines ET upload time," notes Evelyn-Veere, "and the system then automatically adjusts the irrigation."

Adds Ed Shoemaker of Rain Bird Golf Sales: "We're finding very few superintendents who have any problem with this concept." If there is a problem, it is trying to get golf course superintendents to think in terms of *inches* of water rather than amount of *time* the system is switched on.

A handy secondary function of the system is that it can switch lights, open gates, operate fountains—virtually anything that has an on-off switch.

Toro's entry is the Network 8000. Its user chooses one of the four ET measurement methods, and that method is used to drive the system, determining each day what amount of water must be dispersed to replace the water lost to ET. The four choices are based on:

(1) Temperature: every Network 8000 satellite has a built-in ability to measure temperature, and ET can be calculated from an equation based on the high and low daily temperature and the area's latitude and longitude;

(2) Solar radiation and other data available from an attached weather station (temperature, wind speed, relative humidity);

(3) Historical ET data: ET data for the last 30 years is available, and if monthly values are assigned, a projection can be made automatically of how much water to apply at a specific time of the year;

(4) CIMIS, California Irrigation Management Information System: a network of 60-plus weather stations around California that daily collect data and feed it to the University of California at Davis, where phone modem access is provided to anyone who wants to use the data for a specific locale.

The Network 8000 is fully automatic, but a key requirement is that all nozzle data be entered into the system's IBM personal computer. With

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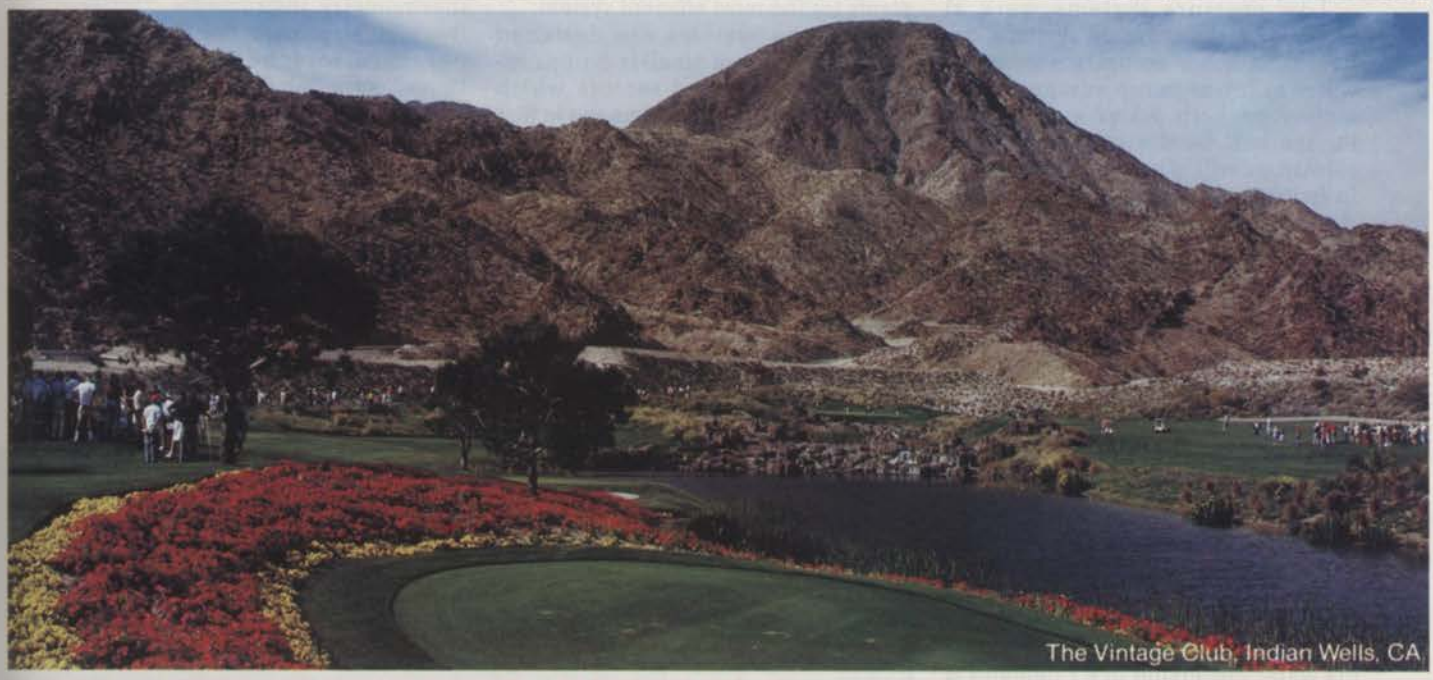
Two Reasons Why Today's Golf Courses are Going Rain Bird:



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. . . TO THE LAST DROP *from page 20*

ate under lower pressure. Low-pressure irrigation is a new concept for which technology and equipment have only recently been developed and implemented (see story page 20).

Low-pressure systems work at lower P.S.I. than present systems, delivering a more accurate amount of water at lower pump energy, saving money on both water and energy. Pumps will be designed more efficiently, as will other equipment used in irrigation systems, such as piping.

According to Rain Bird's Ed Shoemaker, pump technology has advanced significantly over the last 10 years. Improvements have been made in controls, pressure regulating valves and surge tanks.

A key to the future, he says, will be to match irrigation systems to pumping plants for the most efficient system.

Pumping systems are designed now as a series of smaller pumps installed with demand sensors which control pump flow. If someone is just using a hose to water flowers around the clubhouse, only the first, smallest pump will be activated to provide water to save energy and wear and tear.

Computerization of the pumps and low-pressure systems will make them even more accurate.

Advanced technology for irrigation efficiency will be simplified further through portable infrared thermometry instruments. "Infrared thermometry reads the canopy temperature to schedule irrigation times," says Bob Carrow, Ph.D., University of Georgia.

"The canopy temperature rises when moisture stress begins and before wilt shows," Carrow says. The technology is designed to prevent both over- and under-watering. Irri-

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More 'eyes' for turf managers *from page 20*

tem's IBM personal computer. With nozzle radius, spacing, and flow data entered, the precipitation rate can be accurately determined for each Network 8000 station, and the desired water flow more closely matches actual ET.

A further enhancement of matching water dispersion to ET demand is accomplished through entering data from each station into the system. "We knew that turf managers would want to customize their watering based on the characteristics of each course," says Toro Irrigation's Terry Mylne, "and that's really the only way you're going to be sure you're not over- or under-watering.

"Our solution was to create a system that assigned values for type of soil and turf, soil compaction levels, and slope of soil for each station. Special groupings such as north or south facing slopes, and rocks, trees and beaches may also be entered. All of these 'attachments and attributes,' as we call them, become associated with every station, and can all be scaled up or down for relative importance."

Motorola has been using weather station technology in agriculture for about 15 years, according to Motorola's Eric Scott. But it has only been within the last year that the company has entered the golf course market with a weather station-equipped irrigation system. The reason: "The education of superintendents is increasing, and these people are becoming more aware of these things," Scott says. "The industry is more receptive to high-tech."

Motorola's systems, the 3500 and 5000, gather data which is transferred by radio, technology which the company is noted for, to a central computer which adjusts the system accordingly. Software for the system was written along Motorola specifications by International Hydrological Services, a consulting firm of former irrigation industry members.

Rene Evelyn-Veere of Rain Bird says the golf course superintendent remains the expert, despite new technology.

The system only operates under optimum flow and pressure conditions, Scott says. If conditions necessitate it, the computer will prioritize areas to be irrigated: greens first, then tees and so on.

A hand-held monitor that measures plant stress much like a weather station is being marketed by Standard Oil. The ST-27 Turf Monitor, a "gun" attached to a computer worn at the waist on a shoulder strap, monitors the physiological state of the turf. After measuring the plant's leaf temperature, ambient temperature, relative humidity and solar radiation load, the data is processed by the computer. The resulting "stress index" gives the turf manager information needed to analyze irrigation effectiveness and project irrigation requirements.

"Its ultimate purpose is to serve as an additional set of 'eyes' for the superintendent," notes Steve DeSutter of Standard Oil.

New water-saving technology is not just limited to hardware. Indeed, most turfseed marketers are currently studying varieties with better drought-tolerance characteristics. It is generally known that Bermudagrass, zoysiagrass, tall fescue and creeping bentgrass have excellent to good heat hardiness. As improved varieties are released over the next few years, water use promises to decrease—as it must.

—Jerry Roche

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. . . TO THE LAST DROP *from page 22*

gation models have been developed for a number of turfgrass species.

Three companies market infrared thermometry instruments: Everest Instruments, AgriTemp and Standard Oil. Carrow says only Standard Oil has combined the thermometry with a computer.

According to Standard Oil's Bronson Gardner, the six-pound unit combines a thermometer gun with a 64K computer worn by a strap over the shoulder.

"Based on field research, we've developed a model which measures what the canopy temperature is and should be," Gardner says. "There doesn't seem to be a difference from warm- to cool-season grasses in evaporation rate and canopy temperature."

In some respects, says Gardner, the instrument works like a portable weather station. Called the ST-27 because it can store information for up to 27 holes on a golf course, it monitors air temperature, humidity, sunlight intensity and canopy temperature for fairway, green, tee, rough and another spot of choice on each hole.

Steve DeSutter, sensor technologies manager for Standard Oil's Engineering Materials Company, says that, since the ST-27 is portable, it is more area specific than a weather station, giving more accurate readings for more areas on the course.

The computer makes readings four times a second and can recall a three-day history for each spot and print the history in graph form when downloaded onto a printer. From this data, a landscape manager could work out an irrigation schedule. The ST-27 was expected to be in distribution at the end of June.

"The sky's the limit" for technological advancements, notes Neil J. Bustamante, a superintendent at a Hawaiian resort golf course. But, he cautions, "it should be remembered that those assigned the responsibilities of operation of these systems have their 'limitations.'" **LM**

A dry idea, sort of

It is water conservation brought to an art form. And it draws from every aspect of water conservation.

The only thing new about the concept is its name: "xeriscaping," a term that originated in the Denver area less than 10 years ago.

The name is appropriate, though slightly inaccurate. It is derived from the Greek "xeros," meaning dry. However, xeriscaping is not a totally dry method of landscaping. All living plants require a certain amount of water.

Rather, xeriscaping is a combination of landscape design techniques: reducing areas of ever-thirsty turf, using water-conserving plants well-adapted to native soils grouped together in "hydrozones" (areas containing plants with like irrigation needs), and efficient irrigation systems used *only* when necessary.

Xeriscaping is based on seven fundamental principles:

- Start with a good design.
- Improve the soil.
- Use mulch.
- Limit lawn areas.
- Choose low water-use plants.
- Irrigate efficiently.
- Practice good maintenance.

Mulch is recommended to reduce soil moisture evaporation, decrease weed growth and control soil temperatures, eliminating extremes.

Adjusting maintenance practices is also a benefit. Applying less fertilizer, weeding quickly to reduce competition for water, raising mowing heights and mowing more frequently, and aerating for improved water penetration are all beneficial.

Research has been conducted to find the most drought-resistant and water-efficient turfgrasses for use in xeriscaping.

A non-watered, non-mowed roadway corridor in Orange County, Calif. is safer, more attractive and more water-efficient.

Dorothy Borland of The Turf Expert in Denver recommends buffalograss or buffalograss mixed with blue grama for low water use and drought tolerance. But, she notes, the warm-season grasses go dormant from October to May. "Most people who choose buffalograss know something about it," she says.

An added benefit, she notes, is that the native buffalograss only grows to about six or eight inches, and is therefore low-maintenance. But, she stresses, "I am still careful before recommending this grass. It has poor shade tolerance and when thinned by too much water or shade, bluegrass and other weedy plants will invade." She notes that the grass also has a long dormancy period.

In addition, Borland recommends using wheat grasses and smooth brome grasses. Borland says she also has been satisfied with the drought tolerance of improved tall fescues.

The major objective is to reduce bluegrass areas, Borland says, but also

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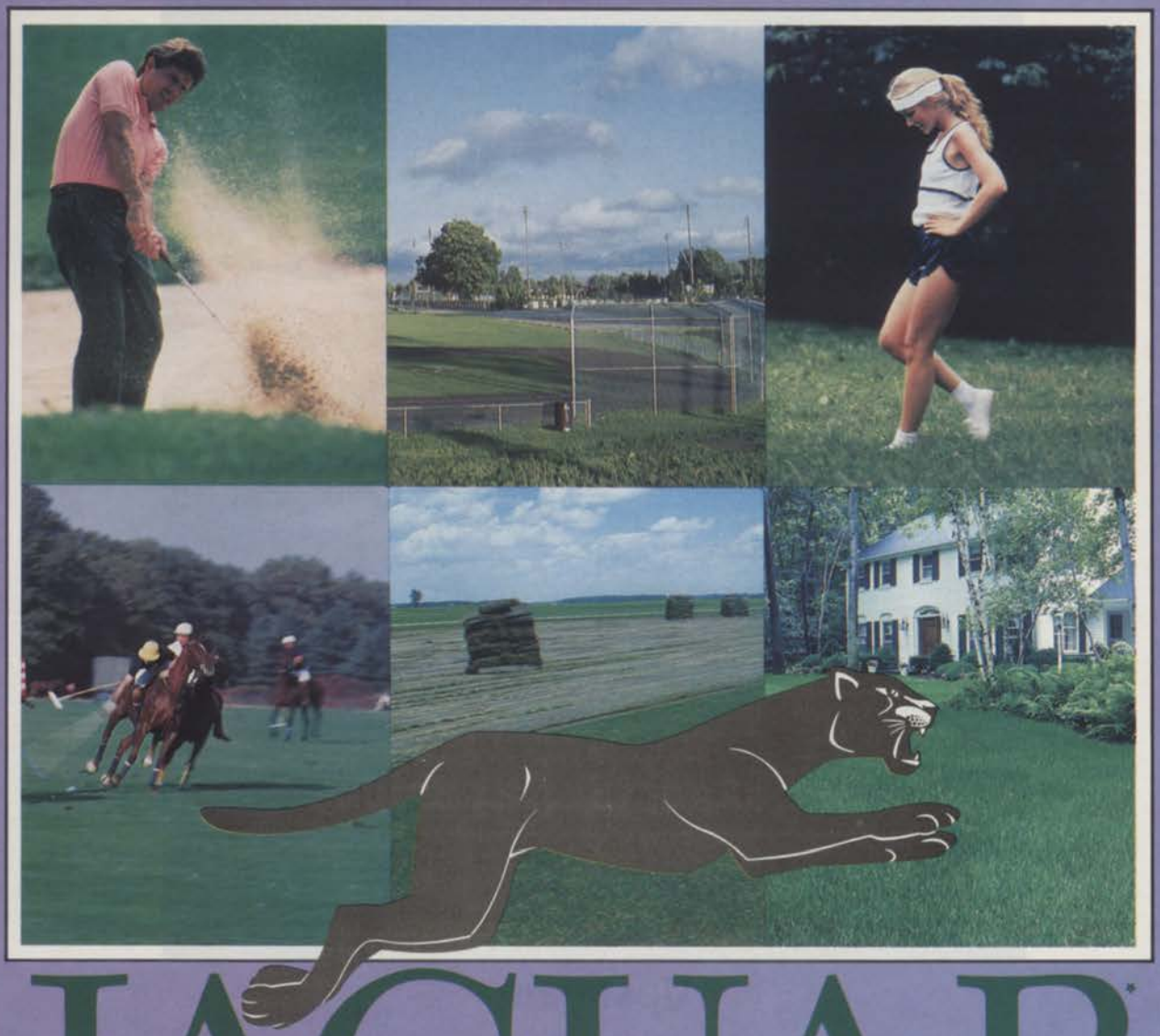
Excellent Overall Performance



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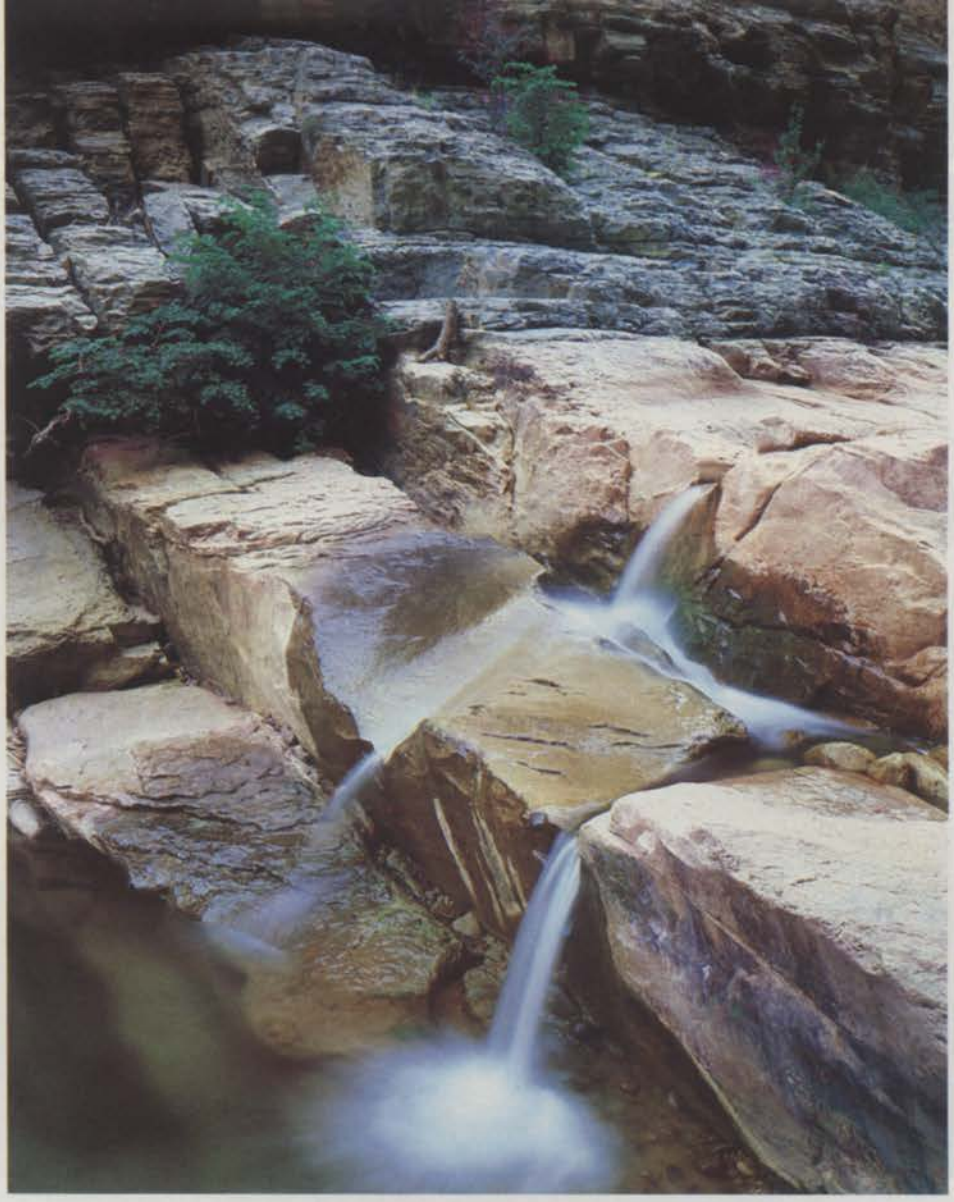

Upstream

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Circle No. 118 on Reader Inquiry Card

A DRY IDEA, *from page 24*

to choose alternatives other than buffalograss. She says that one-third of her clients choose xeriscaping.

Native plants are always recommended for new xeriscapes and conversions to xeriscapes. They are naturally adapted to the soil and environmental conditions and require less maintenance and irrigation. But as with all new plants, natives need to be watered sufficiently until proper root development has occurred.

As for irrigating lawns, Borland says, "so much of it is what they (customers) expect. How little water can we use and still get by with a good-looking lawn?" The key is to find a balance between giving the customer the lawn desired while also giving them the maintenance desired, she adds.

The management principles naturally apply to arid areas where natural rainfall cannot keep up with public consumption, though xeriscaping can be used anywhere. "Inquiries are coming in on a global basis," says Ken Ball of the Denver Water Department. Ball is also secretary of the National Xeriscaping Council.

And xeriscaping is effective, often cutting down on water use outside the home by 40 percent or more.

Becky Garber of Colorado Landscape Enterprises, Arvada, Colo., says her company worked with a group of Aurora homeowners to implement xeriscaping and general water conservation practices on a 6½-acre property called Sunstone. She says the program reduced water bills by $15,000 in one year.

A study was conducted among 548 townhouses in Marin and Sonoma counties in California. Xeriscaped townhouses averaged about an $85 savings compared to conventional landscaping over the eight-and-a-half month test period. More importantly, water use was cut by 30,000 gallons per townhouse, a 54 percent reduction.

Xeriscaping councils exist in seven states (see list for contacts), with an eighth, New Mexico, expected this summer.

To help promote xeriscaping, many community xeriscaping councils have established exhibition gardens to give people a visual idea of what to expect.

"They show plants and how xeriscaping can be pulled off," explains Ball. "If there's something a person can go and wiggle their toes in and sit down with, it's more effective."

—Jeff Sobul

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Circle No. 155 on Reader Inquiry Card

SLIDING AWAY

A valuable resource not given enough thought is soil. Topsoil is frequently lost from runoff due to heavy rainfall or improper irrigation.

While irrigation rates can be adjusted to correct a problem, rainfall can't. The impact of falling water on surface soil can destroy the structure of surface soil, cause surface to settle and seal, decreasing infiltration and increasing runoff, says Penn State's Tom Watschke, Ph.D. Therefore, it becomes necessary to protect the soil from eroding away.

The four basic types of erosion are:

- splash erosion when raindrops strike the soil surface an break soil aggregates into fine particles which can be carried away;
- sheet erosion when water moves across the soil surface and removes thin sheets of soil;
- rill erosion when water moves across the soil surface and cuts small ditches a few inches across; and
- gully erosion when water flows across one spot long enough to cut large gullies.

The best method of erosion control is establishing a good stand of turf. Under good conditions, and without stringent time requirements, reseeding can do the job.

But if the problem is severe, and immediate, Watschke notes it is better to use sod. The sod is more dense, and with bluegrass sod, "it's an instant fix. The day you lay it, the effect on runoff and erosion is immediate," he says.

The slow-establishing seed is less dense and subject to runoff. The problem with sod is a purely economic one. It costs more. Notes Watschke, it comes down to a cost vs. benefit decision.

But other methods are often more economical. They involve using geotextiles, either natural or synthetic.

On reseeded soil, says Watschke, putting a mulch/straw mix on top reduces the impact of rainfall. "The structure of the soil remains, the runoff decreases. Once the plants establish, they will take care of the runoff."

Other natural geotextiles come in blanket form, such as North American Green's straw and/or coconut fiber blankets. According to the company, the blankets are designed to reduce moisture loss while allowing

continued on page 29

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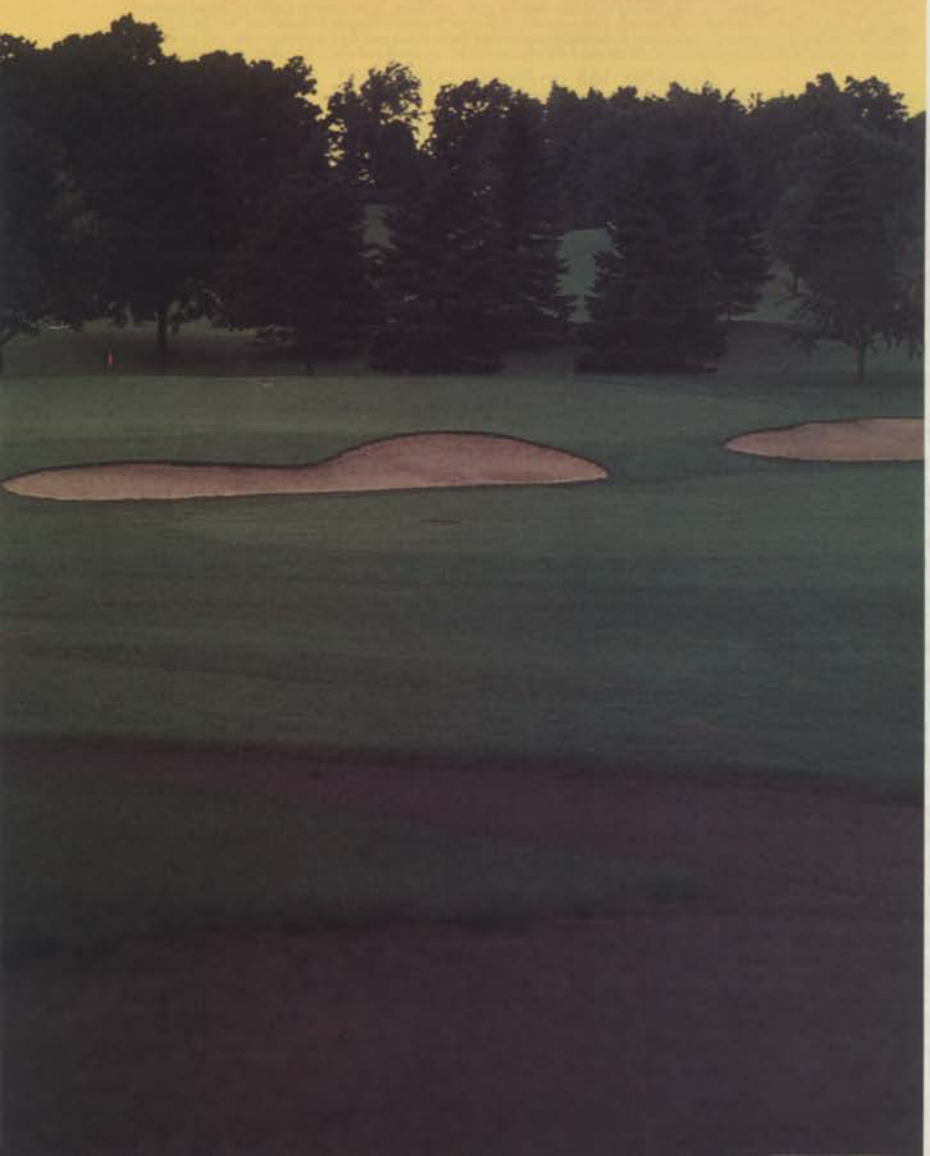

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Circle No. 142 on Reader Inquiry Card

SLIDING AWAY *from page 27*

moisture to infiltrate, and also to keep seed warm to facilitate germination. In time, the blankets brake down to provide a mulch covering.

Synthetic geotextiles come in a number of materials though they generally serve the same purpose as natural. American Enka's Enkamat, actually considered a geomatrix rather than a geotextile, is contructed of nylon monofilaments fused into a three dimensional form which leaves 90 percent of its area open. This area can be filled in with soil, gravel, etc. This stabilizes the soil, allowing seed to germinate. When the turf is established, the material continues to stabilize the soil substrate.

Geotextiles like the polyesters from Warren's and polypropylene Typar from Du Pont control erosion and also prevent weeds from growing. They can be used on flat areas as well as slopes such as river and lake banks, road and rail cuts, etc.

In the end, though, there is only one way to stop erosion, and that is to treat different parcels of land according to the individual needs and capabilities.

—Jeff Sobul

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Local xeriscaping councils

A number of councils exist as part of the National Xeriscape Program Network. The following is a list by state and city with a contact included.

*indicates the program has a xeriscape demonstration garden.

National Xeriscape Council, Inc., c/o Highlands True Value Hardware & Nursery, 8080 S. Holly, Littleton, CO 80122; (303)779-8822. Contact: Jim Grabow, president, NXCI.

ARIZONA

Flagstaff, (602) 774-5281. Contact: Frank Abeyta, Jim Clevenger or Vicki France.

Phoenix, Arizona Municipal Water Users Assn., (602) 256-0999. Contact: Robin Stinette.

Tucson*, Southern Arizona Water Resources Assn., (602) 881-3939. Contact: Marybeth Carlile.

CALIFORNIA

So. California Xeriscape*, Santa Ana, (714) 973-1023. Contact: Mary Cooper

State of California, Department of Water Resources, Office of Water Conservation, Sacramento, (916) 445-4403. Contact: Suzanne Butterfield.

Contra Costa, Contra Costa Water District, Concord, (415) 674-8000. Contact: Debora Maxon.

Fresno, Water Division, (209) 488-1408. Contact: Dave Todd.

Oakland*, Alamo, (415) 820-6600. Contact: Richard Bennett.

San Diego*, San Diego County Water Authority, Cuyamaca College Office of Public Information, (619) 297-3218. Contact: Pete Rios.

COLORADO

Arvada*, Parks Department/Utilities Division, (303) 420-0984/431-3035. Contact: Mike Lee or Sterling Schultz.

Aurora, City of Aurora Utilities, Water Conservation Dept., (303) 695-7387. Contact: Kim Hout.

Boulder, Planning Department, (303) 441-3270. Contact: Peter Pollock, Ron Donahue or Stan Zemler.

Denver*, Denver Water Department, (303) 628-6329. Contact: Ken Ball

Ft. Collins*, Water Utilities Department, (303) 221-6681. Contact: Molly Nortier.

Genesee Estates*, Homeowners Assn., E. Golden, (303) 526-1339. Contact: Muff Mackey.

Greeley, Ext. Svc. Weld County, (303) 356-4000 x.4465. Contact: Donna Liess

Lakewood, Parks & Recreation, (303) 987-7800. Contact: Bill Jewell.

Longmont*, Municipal Utilities, (303) 776-6050. Contact: Kathy Faatz.

Wheat Ridge, Parks Dept., (303) 237-6944 x.283. Contact: Bill Cassel.

FLORIDA

Southern Fla., S. Florida Water Mgmt. District, West Palm Beach, (356) 686-8800 x.391. Contact: Bruce Adams.

NEVADA

Reno*, Great Basin Xeriscape, Inc., (702) 329-4329. Contact: Tom Stille.

Sierra Pacific Power Company*, Reno, (702) 689-4116. Contact: John M. Metcalf.

TEXAS

Abilene, Water Administration, (915) 676-6000. Contact: Cynthia Manning.

Arlington, Utilities Dept., (817) 275-3271. Contact: John Kubala.

Austin*, City of Austin Xeriscape Program, Resource Management Dept., (512) 462-6265. Contact: Martha Latta.

Brownsville*, Public Utilities Board, (512) 544-3800. Contact: Pamela Gross Downing.

Corpus Christi*, Corpus Christi Botanical Society, (512) 992-5337. Contact: Dr. Sue Gardner.

Denton, Operations & Energy Mgmt., (817) 566-8448. Contact: Lisa Tindel.

Ft. Worth*, Ft. Worth Water Department, (817) 870-8220. Contact: Cari Hyden.

McKinney, Heard Natural Science Museum and Wildlife Sanctuary, (214) 542-5566. Contact: Marcia Coale.

San Antonio*, South Central Texas Xeriscape Program, c/o Bexar County Extension Service, (512) 220-2776; Contact also: Doug Welsh, Texas A&M College Station, (409) 845-7341.

WATER USE BY TURFGRASS PLANTS

Three California researchers discuss why turfgrass needs that water you're giving it, and what happens when it gets too much or too little.

By Matt Leonard, Steve Cockerham and Vic Gibeault

This automatic weather station reports local evapotranspiration information as part of a statewide system in California.

Increasing leisure time and a greater awareness of the health benefits of physical exercise have led more people of all ages to become active participants in a wide range of sports and recreational pursuits. As a result, turfgrass acreage in the United States is continuing to grow.

Still, the most persistent force behind the increasing use of turf is population growth. More people translates into more homes, schools, parks and commercial centers, all of which means more turf. As the area under turf increases, there is an increased demand on available water resources. Since it has been demonstrated that turfgrass irrigation is not a high priority when water is allocated, turf managers must become aware of available water-saving options.

The cost of water for irrigation is having an even greater impact on conservation than local supply problems. Fundamental to the water conservation effort is an understanding of how the turfgrass plant uses water.

Matt Leonard is a research scientist, Steve Cockerham superintendent of agricultural operations and Vic Gibeault extension turfgrass specialist. All work at the University of California in Riverside.

Water in grass

Water entering the root from the soil contains plant nutrients as dissolved mineral salts. As water moves up through the root to the stem and leaves, these mineral nutrients are carried along, available for absorption by cells that need them. Water enters the roots and moves through the plant along a continuum of potential gradients. This is the process of moving from a high concentration of water toward a lower concentration. Where water concentration is high, dissolved salt concentration is low and vice versa. This is an important principle as it explains how water moves and carries nutrients throughout a plant, even to the top of the tallest trees.

Light and water

Water is also used in photosynthesis, which is the process of using light en

ergy to make carbohydrates from water, nutrient salts and carbon dioxide. Carbon dioxide is obtained from the atmosphere when it diffuses into the interior of the leaf through pores in the leaf surface.

Pores in the leaf, stomates, are formed by pairs of elongated cells which lie side-by-side attached at each end. An increase in internal water pressure (turgor) within these guard cells swells them, causing the stomates to open. The loss of turgor in the guard cells results in closing the stomates.

Stomates not only allow carbon dioxide to enter, but also permit water to evaporate from the plant into the atmosphere. This water loss is called transpiration. The fate of most of the water taken up by the plant is to be lost to the atmosphere through transpiration, leaving the dissolved nutrient salts behind.

Transpiration's primary function is to dissipate heat from leaves exposed to sunlight. In this process, accumulated heat converts water to vapor, which then diffuses out of the leaf through the stomates. Heat and water vapor are lost. As temperatures rise, so does the rate of transpirational water loss. If transpiration exceeds the rate of water uptake by the roots, the plant experiences water stress. This can result in wilting and, if prolonged, permanent disruption of physiological processes.

Transpiration also pulls water through the plant by maintaining a low concentration of water at the stomates, thus beginning a sort of chain reaction to move water to the leaves from the roots.

Light provides the energy for photosynthesis, and stimulates the opening of the stomates. Stomates are typically open during the day and closed at night, permitting carbon dioxide to enter the plant when the light energy required for photosynthesis is available. It also minimizes water loss from the plant at night.

Moisture stress

Grass plants experience water stress almost daily, usually during mid-afternoon when temperatures peak. As water-stressed plants lose turgor, the stomates close. This prevents further water loss while continued root uptake replenishes the plant and turgor is restored. Increase in turgor reopens the stomates and transpiration resumes. Daytime temperatures are generally lower by the time turgor again builds up and root uptake of water can keep pace with transpiration.

Climatic factors can also influence transpiration rate. Wind quickly moves water vapor away from the leaf surface. This increases the difference in the water vapor concentration between the inside and the outside of the leaf, increasing the transpiration rate. When there is not wind, a layer of still air envelopes the leaf surface, allowing the water vapor concentration outside the leaf to rise, decreasing transpiration. This, again, is due to the principle of water moving from high concentration outside to low concentration. Since the water concentration outside the leaf increases, closer to that of the inside of the leaf, water movement out slows down, which slows water movement throughout the plant.

Grass plants experience water stress almost daily, usually during mid-afternoon when temperatures peak.

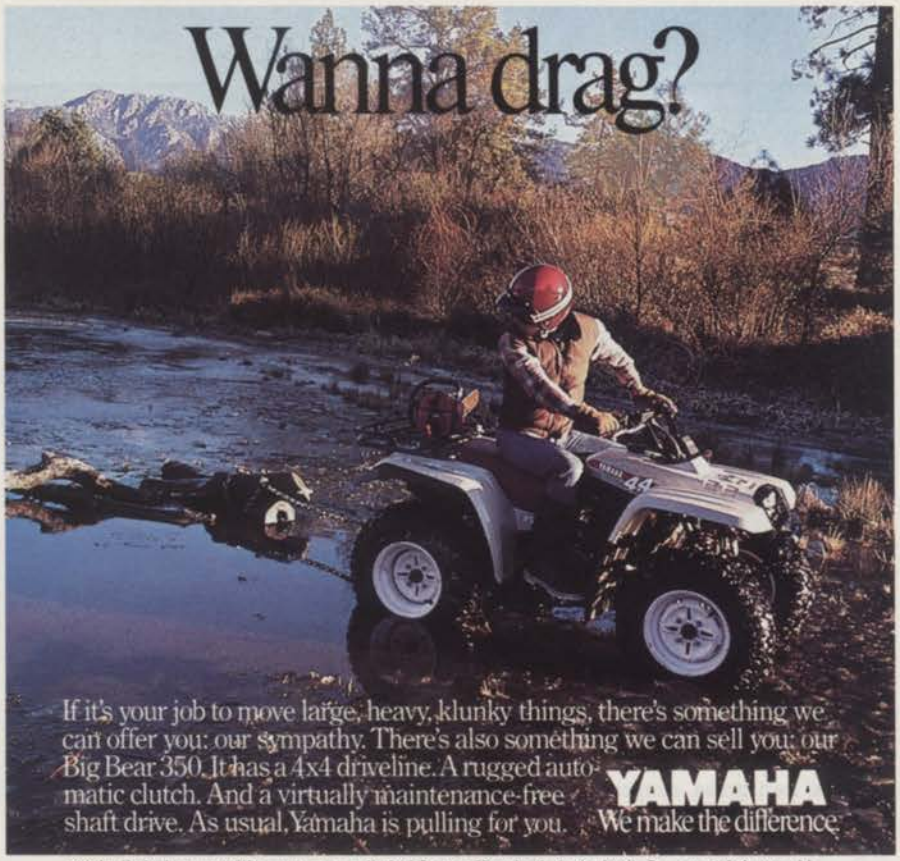
Humidity influences transpiration in a similar fashion. As atmospheric humidity increases, the water vapor gradient across the leaf surface decreases (concentration decreases) and the transpiration rate increases. Low humidity combined with high winds cause a tremendous rise in transpiration rates and quickly lead to water stress.

When stomates close as a result of water stress, the plant is subjected to additional stresses. Heat is no longer dissipated by transpiration. This can injure or possibly kill the plant by disrupting metabolic activities if drought conditions are prolonged. Turf is especially sensitive to mechanical injury during these periods.

Photosynthesis is also inhibited when stomates close. This is because carbon dioxide, an essential ingredient in the photosynthetic reaction, is excluded from the leaf. Without a supply of carbon dioxide, the plant cannot manufacture carbohydrates for building new plant structure. In other words, when the stomates close, growth slows down. Extended water stress can, therefore, adversely affect shoot density and the ability of the plant to recover from injury or disease activity.

Types of turfgrasses

Turfgrasses are typically categorized as being either cool-season or warm-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Cans set out in a grid pattern on a golf green help evaluate the distribution uniformity of the irrigation system.

season species. Cool-season species, as the term implies, are adapted to temperate, northern climates. Bluegrass, bentgrass, ryegrass and fescues are included in this group.

Warm-season species, including Bermudagrass, zoysiagrass, St. Augustine and seashore *paspalum* are adapted to hot, tropical and sub-tropical climates. The differences between warm- and cool-season grasses are much more fundamental than geographic distribution.

Warm-season grasses use significantly less water than cool-season species. This difference in water use derives from changes in the photosynthetic process that occurred in grasses evolving under hot, dry conditions. These changes, which include modifications to biochemical reactions and internal leaf anatomy, greatly enhance the photosynthetic efficiency of warm-season species and help reduce transpiration. Increased photosynthetic efficiency means that plants can maintain high levels of carbohydrate production and continue to grow even when stomates are partially closed. This partial closure of the stomates slows the plant's transpirational water loss.

Cool-season grasses, with a less efficient photosynthetic process, cannot maintain enough carbohydrate production to maintain growth unless their stomates are nearly wide open. Thus, when water is limited, transpiration rates of cool-season grasses are generally higher than those of warm-season grasses.

Root depth density

Important characteristics influencing the ability of plants to avoid water stress are the depth and density of rooting. Grasses with deep root systems have the ability to draw water from a much greater volume of soil. Plus, there is less chance that water will percolate down beyond the reach of the root system. This is a distinct possibility with shallow-rooted species such as Kentucky bluegrass and perennial ryegrass. With these species, soil water beyond a depth of two feet is essentially unavailable. This water would still be within reach of Bermudagrass or tall fescue.

Low humidity combined with high winds cause a tremendous rise in transpiration rates and quickly lead to water stress.

Greater soil penetration by a large number of roots significantly increases the volume of water upon which a plant can draw. Bermudagrass and seashore *paspalum* both send roots down more than five feet, though Bermudagrass has better drought resistance due to a somewhat deeper and better distributed root system.

The fescues commonly exhibit leaf rolling when subjected to water stress. By enclosing the upper leaf surface, where most of the stomates are located, a high level of humidity is maintained within the rolled leaf and transpiration is reduced.

Water used by plants is thought of as the amount lost to transpiration. When considering irrigation of turf, evaporation becomes important as a part of the water use, or rather, the water loss. A practical means of calculating turf water use is to determine the transpiration rate plus the rate of evaporation, referred to as evapotranspiration (ET). ET is the total water lost by turf.

Many states, through water agencies and districts, provide local ET information for agricultural growers and landscape managers. The irrigation industry has been very active in developing ET guidelines for the turf industry.

Irrigation systems

Though substantial water savings can be realized through proper species selection, those same savings can be just as quickly dissipated by a sprinkler irrigation system with poor distribution uniformity.

The quickest and most effective way to evaluate the distribution uniformity is to perform a can test. This is done by setting out a number of uniform, open-topped containers (motor oil cans, plastic cups, etc.) in a grid pattern over the area to be tested. Distance between containers is up to the user, but should be close enough to be meaningful (10 or 20 feet are often used). The accuracy of the test increases as the number of containers increases. Spacing between containers should be equal.

The sprinkler system should be turned on for about 15 minutes. If the user does not wish to record data, simply looking into and comparing the containers will indicate whether the system is nearly uniform or not. If recorded data would be useful, e.g. to make a point with administrators, measure the amount of water collected in each container.

Measurements are made into a measuring cup or graduated cylinder, being careful to note the grid location of the measurement. Ideally, all measurements would be equal. In reality, the values will vary somewhat. If major discrepencies are evident in values from container to container or from one part of the test area to another, the uniformity of water distribution needs to be improved. Unless the problem is obvious, like a malfunctioning sprinkler head, the system should be evaluated by an irrigation consultant. The resultant savings in both water and money can be significant.

Efficient water use and conservation opportunities are based on selection of grasses, their culture and the efficiency of the irrigation system. All of this is site-specific so the manager must become involved in the use of this vital natural resource. **LM**

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This water-efficient low-pressure irrigation system at Canyon Country Club is also a money-saver.

IRRIGATION REVELATIONS

Low-pressure irrigation combined with computerized controls spelled an annual savings of 50 percent for this California country club.

A quiet revelation has come over the Coachella Valley outside Palm Springs, Calif. Industry experts say the revelation has the potential to drastically change energy and water usage by turf managers, particularly in arid and semi-arid locations.

The Valley has more desert golf courses than anywhere in the world. In October, 1986, the area also became the site of the first irrigation installation to combine low-pressure sprinkling with a computerized control system.

This revelation is that turf managers can use low-pressure sprinkler heads for varied energy savings; that they can also control their precipitation rate, and match actual evapotranspiration rate (ET), unlike ever before.

Center of attention went to Canyon Country Club, a typically-lush desert golf course surrounded on three sides by the Santa Rosa mountains where Richard Ameny is general manager. He, more than any other person, deserves credit for combining the two concepts, low-pressure and computers.

The local power company, Southern California Edison, showed an interest in developing alternative technologies and products that would allow golf courses to use less water and consequently less energy on a continuous basis. That interest led Edison's Tom Olson to low-pressure sprinkler heads, a new technology that had been in development at various irrigation manufacturers for a number of years.

Low-pressure heads operate effectively at much lower P.S.I. than regular sprinkler heads, and the pumps are able to do their job in less time. With pumps operating for a shorter time span, the off-peak demand period was a possibility for golf courses and other turf areas.

Ameny had come to Palm Springs from Washington State, where he gained years of turf management experience in a humid and wet environment. Ameny had promised the club's board that he would effect major reductions in the maintenance budget, and still maintain the course's lush, well-tended appearance.

First, he changed certain management practices that immediately dropped Canyon's fixed maintenance costs by $25,000. To really affect the course's $850,000 budget, however, he needed to do something dramatic.

That's when Olson suggested low-pressure irrigation.

continued on page 36

POP QUIZ

1. WHAT DO YOU CALL A TALL FESCUE THAT LOOKS LIKE BLUEGRASS?

- ☐ KENFESCUE BLUEGRASS
- ☐ TALLTUCKY GRASS
- ☐ BLUE FESCUE
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REVELATION *from page 34*

After his talks with Olson, Ameny contacted the three manufacturers who were then touting low-pressure sprinkler technology, and asked each to install products in a test plot he had laid out on the golf course. The ultimate winner was Toro's 660 Series of low-pressure heads, which "performed faultlessly," said Ameny.

Canyon's membership board was ready for the installation. The proposal for a new, more efficient irrigation system had been made three times in three years, but it took the energy savings of a low-pressure system to convince the board that the cost could be quickly amortized. Olson notes that Ameny deserves a lot of credit for switching to low-pressure heads at a time when other courses had not taken the leap.

"It's a close-knit world among the desert courses, and they're somewhat conservative," says Olson. "These courses are beautiful and prestigious, and not many general managers or superintendents in the area are risk-takers. They want to see what the other courses are doing before they commit to a new way.

"In this case, the timing was good, because Ameny was ready for something new, and maybe his being from outside the area made him more open to other ideas. I have to admit that I didn't see much beyond the energy savings that were going to result from low-pressure sprinkling, but Dick did: they've had savings from labor, fertilizer, chemicals and the amount of water they need."

While Tom Olson brought low-pressure irrigation to Dick Ameny's attention, Ameny himself investigated another new concept, computerized irrigation control. He questioned if there was any reason why the two recently-developed technologies couldn't operate together, for even larger maintenance savings.

Toro's Network 8000 combines a central computer with stand-alone satellites. It was developed to solve the problem of accurately measuring a turf area's actual demand for water through evaporation (ET) loss (see "More eyes for turf managers" on page 20).

Having made his choices in product, Dick Ameny worked closely with all of his contractors and suppliers. "It's unusual for a general manager to get as involved in a new irrigation installation as Ameny did," observes Olson, "but then again, all concerned knew they were breaking fresh ground."

A state-of-the-art Toro Network 8000 system like the used at Canyon Country Club.

The Canyon "groundbreakers" included consultant Roger Gordon, who designed the new irrigation system; Pacific Equipment and Irrigation Company, the distributor who supplied the products; and McCalla Brothers, who installed a new well. Foremost Construction Company, which installed the system and advised Ameny on the intricacies of the massive installation, was also important to the project's overall direction.

Gordon notes that, having decided to proceed, Canyon and Ameny moved quickly. "We essentially had three months to totally revamp the old quick-coupler system," said Gordon. "Most club members leave in April or May, so the system had to be installed between then and September, in order to be ready for the overseeding period.

"The old Bermuda is dethatched and the course is reseeded with ryegrass so it'll be picture-perfect when the members return from other parts of the country." The installation was "smooth as silk," he says. "There were minor problems, such as bringing all the pipes, communications cables, and electrical wiring under the four or five street crossings, but preparation and working with an experienced contractor are two keys to success.

"Between the lack of water and humidity and the winds, the Palm Springs area in general is hostile to growing grass, and you have to make it happen in spite of itself. Still, the Canyon job was the most effortless way I've ever forced anything.

"The satisfying thing was that the course immediately took less water than before, got a better start on the new grass, and the members were able to get out and play on it sooner. And that system really got the test of its life the first time out of the box. If a course down there can make it through reseeding, it can make it through anything. When it's applicable, I'm convinced that low-pressure is the way to go. The heads don't cost any more than other products, and you could literally take every installation my company has done over the past 20 years, screw out the old heads, screw in new low-pressure heads, and be in business.

"After making appropriate changes to the pump station and lowering the P.S.I., you'll immediately get a lower electric bill."

The Canyon system has been operating since the first week of October, 1986, and projecting current costs through the remainder of the year, Ameny says his water and electric bill will be $40,000 less in 1986-87, for nearly a 50 percent reduction.

In addition to taking advantage of the off-peak demand period, the low-pressure heads allow the golf course to use one new well (rather than two older, less-efficient wells), and reduce the booster station pressure to 80 P.S.I. from 135 P.S.I. The precisely-calculated ET data from the controller afforded further water and energy savings. The first-year maintenance savings includes a workforce reduction of two full-time employees who were necessary with the old, labor-intensive quick coupler system and further savings on fertilizers and chemicals that previously leached out much more quickly.

The total maintenance budget for 1986-87 is expected to drop by $113,000 or 14 percent.

For the turf management industry, the development promises even more. As Toro's Terry Mylne notes, the industry has moved from "gut feel" estimates of ET demand to a precisely calculated equation and a method of dispersing it efficiently.

Perhaps just as important for the future of water conservation, the marriage of new irrigation technologies, and their availability to virtually everyone, assures that the turf industry can take a leadership role in overseeing world water resources wisely and judiciously. **LM**

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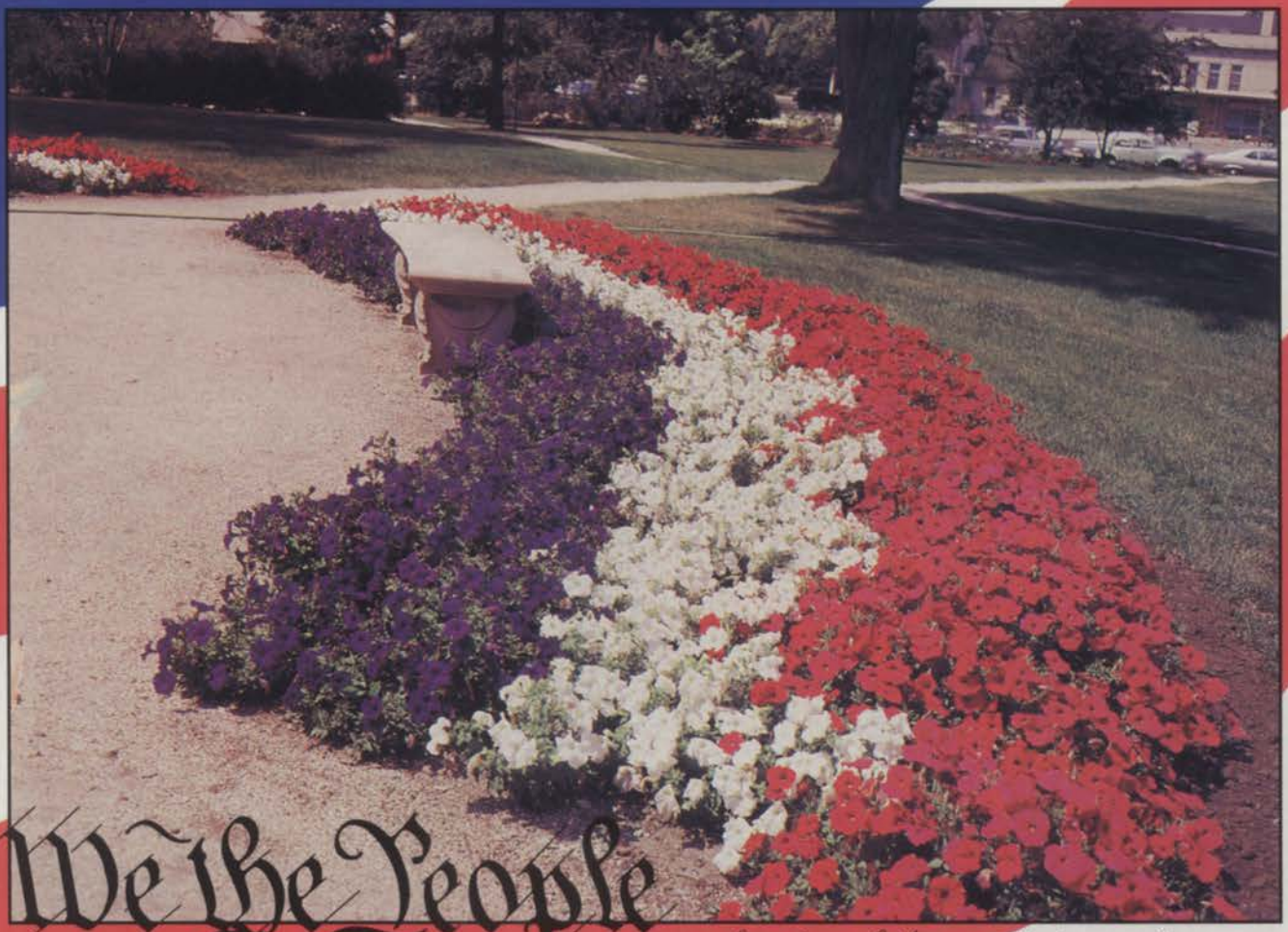
Circle No. 129 on Reader Inquiry Card

On Design

Patriotic Plantings

by Heide Aungst, managing editor



We the People

our founding fathers wrote two centuries ago. On Sept. 17, the Constitution celebrates its bicentennial. To commemorate the occasion, bicentennial chairman Warren Burger has asked communities to plant red, white and blue gardens. Petunias provide just the right hues for a classic patriotic planting, as illustrated by the gardens at the Ball Seed Co. in Chicago, Ill. (above, lower right). The Constitution gardens can get more creative, such as this flag at the University of Minnesota (upper right). Red and white begonias make up the stripes, while dusty miller creates one large star in the corner.

Photos courtesy of Bedding Plants, Inc.

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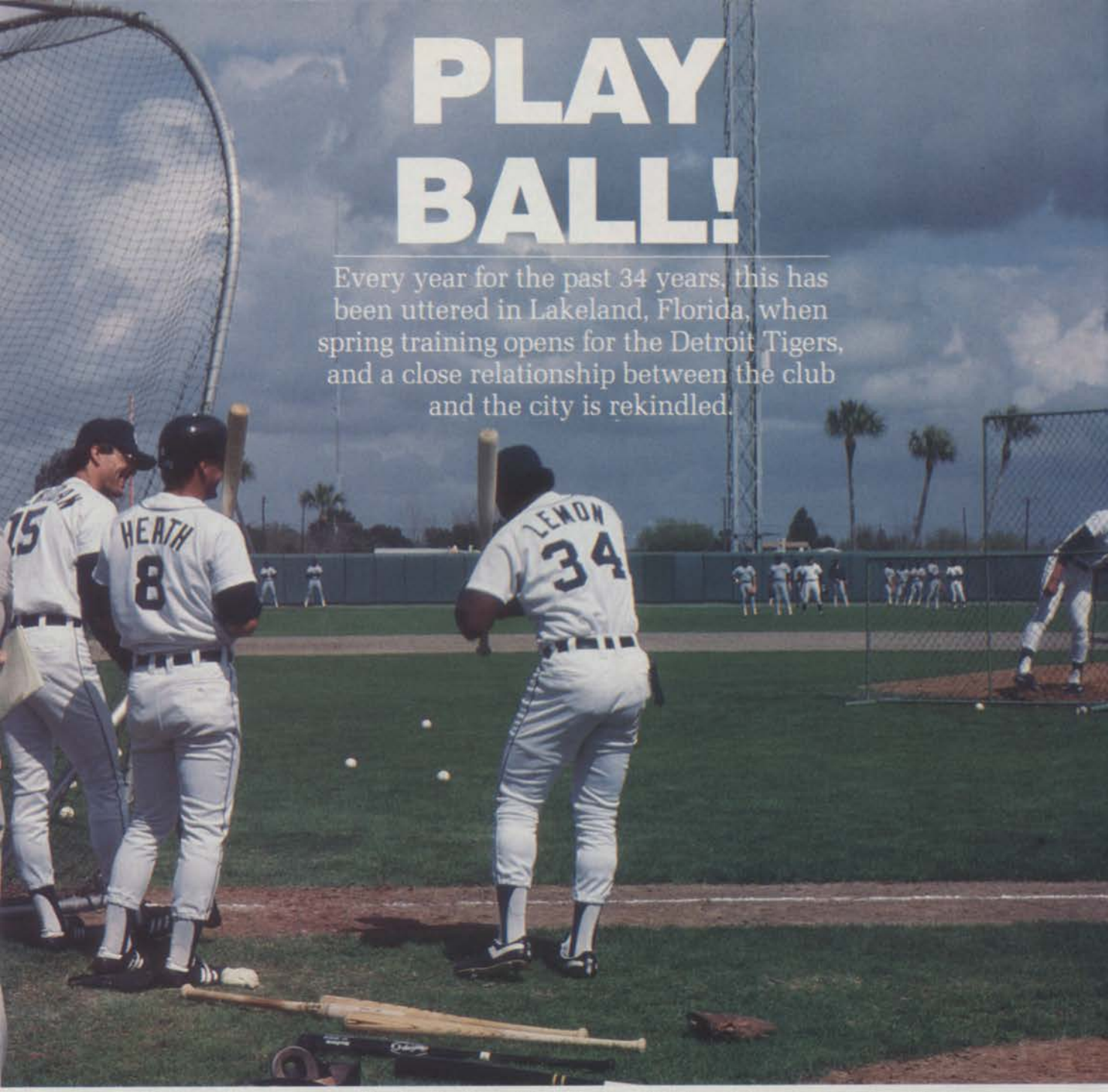
Circle No. 107 on Reader Inquiry Card

PLAY BALL!

Every year for the past 34 years, this has been uttered in Lakeland, Florida, when spring training opens for the Detroit Tigers, and a close relationship between the club and the city is rekindled.



Spring Training home opener against the Red Sox, Joker Marchant Stadium: Tigers centerfielders Chet Lemon times a batting practice pitch.

Every late winter, the storied "Boys of Summer" hop onto their stretch of highway (or jetstream) and follow it south. There, they find a climate conducive to reviving their stamina, remembering their signals, and relocating the strike zone.

And a few major league baseball teams find something more when they go to spring training—close friends, even surrogate families, in a community that embraces them and acts as a home away from home for a couple months.

One of those fortunate teams is the Detroit Tigers, which has been following I-75 South all the way to Lakeland, Fla., for 34 straight Februaries. And for all of those 34 years, they've felt comfortable leaving their grounds crew back in the Motor City cold.

"We consider it a symbiotic relationship," says Bill Tinsley, Lakeland's assistant director of Parks and Recreation and point man for the city's maintenance of Tigertown, the Tigers' spring training facility. "The Tigers get a community that cares for them and a Grade A training facility, and Lakeland gets a tourist attraction, some great entertainment and a great bunch of friends."

The larger municipality/franchise relationship has thrived on a series of personal relationships. Jim Campbell, president of the Tigers, and Joker Marchant, director of Parks and Recreation in Lakeland for three decades until 1978, developed a mutually supportive relationship.

After Marchant's retirement, with the endorsement of both the Tigers and the City of Lakeland, Tigertown's 5,500-seat stadium was re-named Joker Marchant Stadium. However, relationships are more the fringe ben-

Continued on page 46

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86-58

Circle No. 105 on Reader Inquiry Card

efit than the selling point for Lakeland. When you have one of the finest defenses up the middle in the American League, as the Tigers do (second baseman Lou Whitaker, shortstop Alan Trammell, and center fielder Chet Lemon), you demand a near-perfect playing field on which to tune up these stars' considerable talents.

No bad bounces

For the length of their relationship with Lakeland, the Tigers have demanded, and received, just that. "You don't get a bad bounce in Lakeland," Tinsley says proudly.

And the rest of Florida's spring training hosts apparently agree, because Tinsley and his three-man crew (seven more during the season) are often invited to "have a look" at other facilities around the state. "It has to be a year-round program, that's the key," Tinsley says, and refers to his mental calendar, readily available thanks to 11 years of spring training experience.

Play starts in Marchant Stadium in February, with a couple college games to lead into the Tigers' spring training season, which begins in early March and goes for 15 games into early April. The Lakeland Tigers, Detroit's Triple-A minor league club, will occupy the stadium through early September.

"Some time in mid-April, during the Lakeland Tigers first long road trip, we'll begin stressing out the overseeded perennial rye and start re-establishing the Bermuda," Tinsley begins. Because of the warm weather at this time of year, the process is fairly simple, consisting of reducing watering, mowing closer, and finally verti-cutting.

Bill Tinsley (right) and Robert Fletcher, head groundskeeper at the Tigertown complex, inspect the playing surface from the pitcher's mound.

Demand for a near-perfect field keeps the ground crew busy. Here, a crew member prepares home plate.

I've seen pitcher's mounds in 25-year-old stadiums that are five feet higher than they were intended to be.'

—Bill Tinsley
City of Lakeland

Tinsley's Bermuda-of-choice is a hybrid, Tifway 419. "It's extremely tolerant to the kind of abuse baseball cleats can administer over time." Then, in early May, Tinsley has his staff apply a preventive insecticide treatment. "We apply Oftanol. It goes down and gets those mole crickets waiting to scramble out in the summer," he says.

The preventive application is usually "all it takes," he explains, except during particularly warm winters, when a follow-up fall application may be necessary. "The mole crickets get their schedules all off if we don't have a freeze until January, so they're up there scooting around," he explains. At eight different points in the calendar year, for the past six years, Tinsley and his team have aerated the field, pulling three-inch plugs heavy in loam material and replacing them with straight No. 50 sieve white D.O.T. sand. They're starting to pull up white plugs now, he says, and the transition is almost complete.

"We're noticing a vast improvement in our drainage percolation, and we've pushed the root structure down to some eight-to-10 inches," he says. "Previously, too much of the moisture and nutrients were being trapped at the top, inhibiting our root structure."

Tinsley points out that a healthy root system is particularly vital on a baseball field. "It directly determines how much abuse the top part of the plant is going to take," he explains. "We can actually take a worn-out piece of the field and, with an intensive fertilization and watering program, bring it back in 10 to 20 days."

The other half

But turf is only half of the maintenance story for a baseball groundskeeper. The other half is the clay and sand of the basepaths and pitcher's mound. "The biggest maintenance headaches on a baseball field are the buildup of lips along the edges of your basepaths," Tinsley says. "They can lose a ball game for you with a bad bounce."

The basepaths and pitcher's mound at Marchant have a clay base topped with a black sand mixed with an aggregate. This topping gives a good background for sighting a baseball and also provides a cushion to

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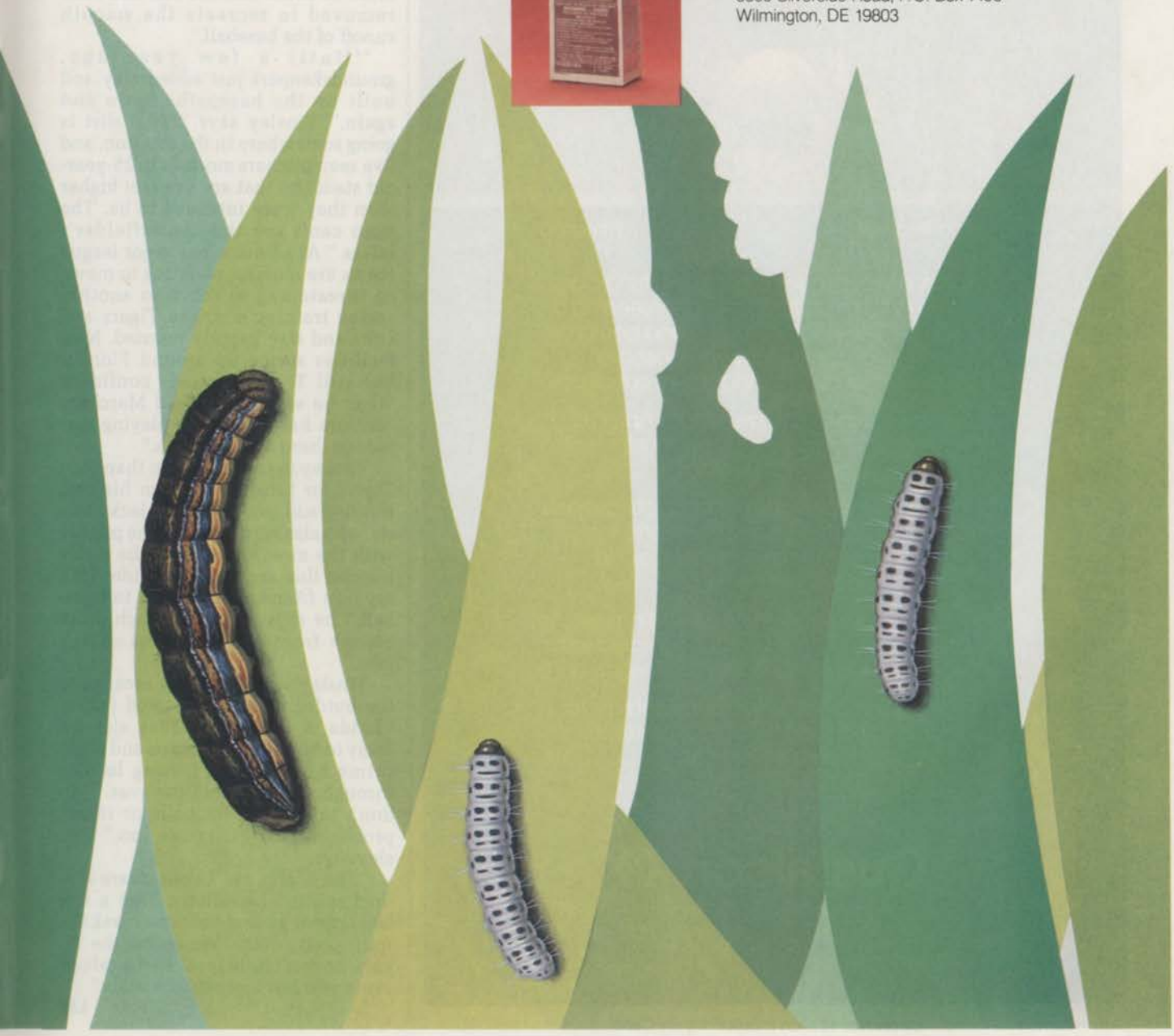

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Circle No. 117 on Reader Inquiry Card

PLAY BALL *from page 46*

protect the clay from getting torn at and dug up. It's a program that's been used in Tigertown for 25 years, and "the rest of Florida is starting to catch on," Tinsley says.

Every December, the crew will completely renovate the basepaths and mound, digging them up, redistributing the clay, and leveling them. "That leaves us another month-and-a-half of settling and rolling to prepare for play," Tinsley notes.

Even though his crew daily sweeps the sand and soil back from the grass into the basepaths, eventually it builds up, and the "lips" Tinsley mentioned build up in the turf at the edges of the basepaths. "That's something Whitaker and Trammell would rather not see," he says. At this point, the sod must be lifted and the soil and sand removed to recreate the smooth runoff of the baseball.

"Until a few year ago, groundskeepers just added clay and built up the basepaths again and again," Tinsley says. "That dirt is going somewhere in the stadium, and I've seen pitchers mounds in 25-year-old stadiums that are five feet higher than they were intended to be. The ump can't see the centerfielder's knees." At a time when major league teams are moving, planning to move, or threatening to move to another spring training site, the Tigers and Lakeland stay happily married. New facilities spring up around Florida, but still Tinsley sounds confident when he says 20-year-old Marchant Stadium has "as good a playing surface as there is in the state."

Tinsley in particular can thank the Tigers for bringing to town his best hunting and fishing buddy, Jack Morris, who also happens to be the pitcher with the most victories in the major leagues this decade. "I consider Jack my best friend, and not just in baseball," he says. "We help each other escape from the pressures of our jobs."

Tinsley's and Morris's escapes to the outdoors aren't relegated just to Florida in the spring. They also get away to Michigan, Montana and other prime hunting and fishing locales throughout the rest of the year. "We don't talk about fastballs or insect problems, I can guarantee you," Tinsley says.

"The Tigers and Lakeland are kindred spirits," he reflects. "But a few bad-hopper ground balls can break the spirit pretty quick. We realize the Tigers haven't returned to Lakeland every year just to see their friends."

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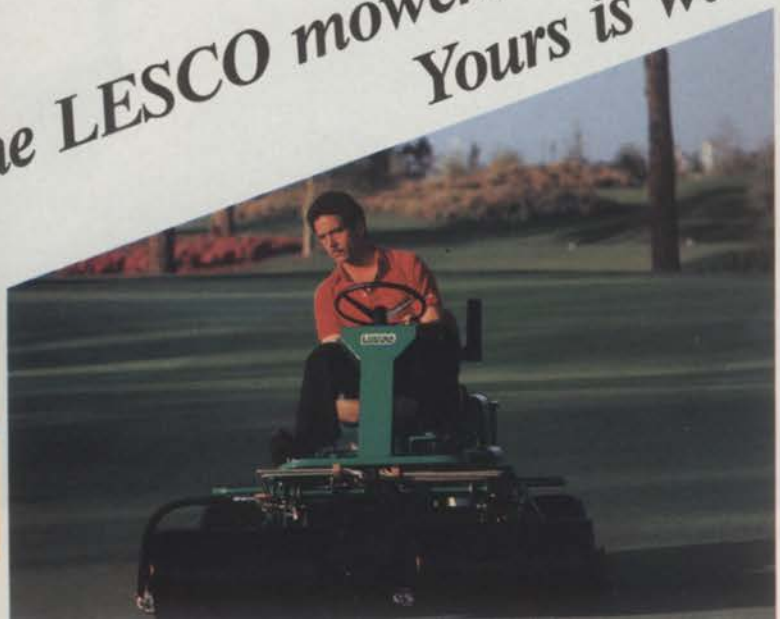

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WORKING ON THE RAILROAD

Plants aren't the only resource for landscape managers. Here's how to turn old railroad ties into classy landscape features.

by *Ronald C. Smith, Ph.D*

Used railroad ties can be an effective feature of any landscape setting. Because of their mass and strength, railroad ties may also be used for any number of functional purposes.

Railroad ties are available from a number of sources around the country. Nurseries, lumber yards and railroad maintenance yards themselves are potential outlets for railroad tie selection.

Check the local newspapers for advertisements. In some cases, the ties are sold only in large lot sizes, in other cases, they are sold individually.

A railroad tie is a block of wood which measures approximately eight-feet six-inches in length, with the widths varying from 6x6-inches to 7x9 inches. In weight, the variation is much greater, from as little as 125 pounds to close to 200 pounds.

In some locations, crossing ties and switch ties are available and range in length anywhere from nine to 12 feet. At the time of forming, railroad ties are pressure treated with creosote and over the decades of supporting the tracks, have bled out any excess preservative, making them relatively safe to use in the landscape.

Ronald Smith is an extension horticulturist at North Dakota State University.

Landscape ties vs. railroad ties

Landscape ties and railroad ties are not the same material and should not be used together in the same landscape setting. The neat, clean surface and smaller scale of the landscape tie is a direct contrast to the uneven wearing and often rock-scarred, sun-bleached, coarse-textured railroad tie.

In some areas, new railroad ties are sold. For landscape purposes, these should be avoided. During high summer temperatures, these new ties will bleed excessive creosote, which has some volatilization qualities that could cause damage to surrounding plant material.

Additionally, the cost of these new railroad ties is usually prohibitive for their intended purpose in the landscape. The cost of used ties will run anywhere from free for the taking, to as high as $15 each.

The prudent user can fare just about as well by being selective with the free or lower cost ties.

Endless possibilities

In planning any construction project, consider used railroad ties as a possibility for materials. Rustic walkways, outdoor steps, rugged fences, borders around patios,

continued on page 54

Railroad ties can be cut and set to define a planting bed.

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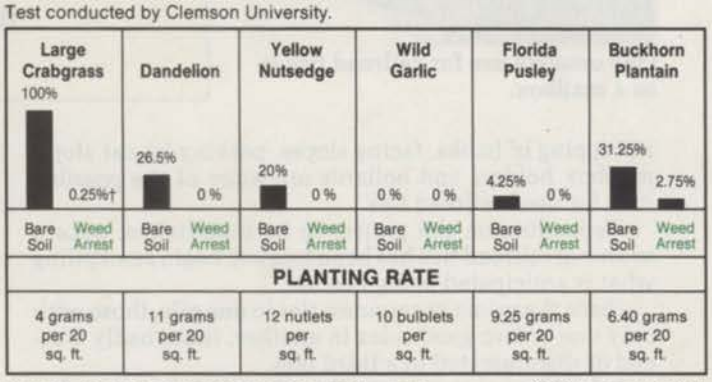
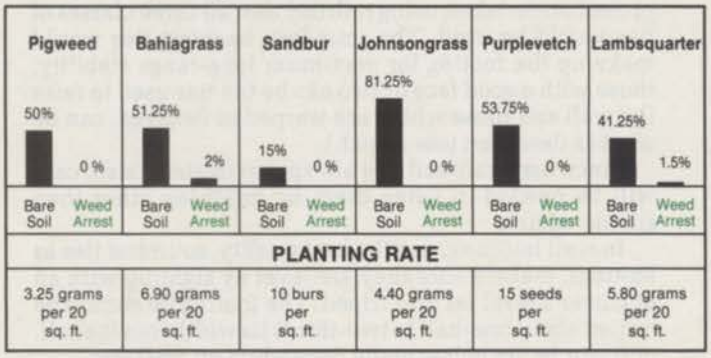


Percents refer to the percentage of area covered by weeds. †0.25% means 1/4 of 1%



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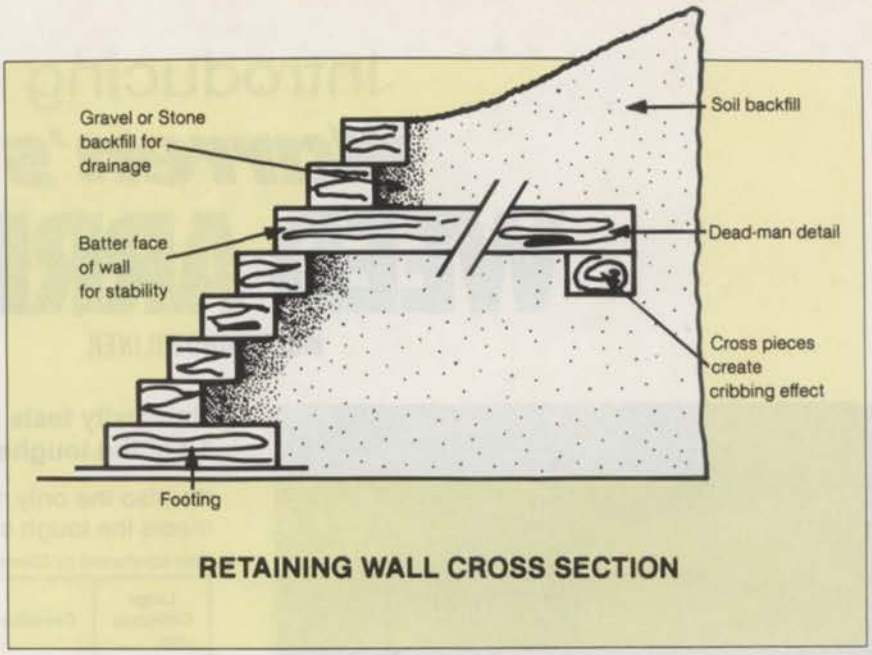
RAILROAD *from page 50*

One creative use for railroad ties is as a mailbox.



RETAINING WALL CROSS SECTION

riprapping of banks, facing slopes, parking lot car stops, mailbox holders and bollards are some of the possible uses for used railroad ties.

Depending on the project to be undertaken, once a source of railroad ties has been located, begin stockpiling what is anticipated being needed.

Place the prime or soundest ties in one pile, those with only one or two good sides in another, those badly warped or disintegrated in a third pile.

In building a retaining wall, perhaps the most complex project undertaken using railroad ties, all three classes of ties would be used. The soundest, heaviest ties would make up the footing for maximum long-range stability, those with a good face or two can be the ties used to raise the wall and those which are warped or decayed, can be used as deadmen (see sketch).

Since used railroad ties are approximate in size, care will be needed in using them for anything other than simple edging.

In wall building, use the best quality, soundest ties as footings, making sure they are level by sighting with an engineer's level set on a tripod. The footing tie should be buried about one-half to two-thirds its width into the soil, or it can be set below grade depending on wall size.

Where the soil is unstable, drill holes through the ties in three evenly spaced places with a 1/2-inch auger, then use a sledge to drive a #4 concrete rebar into the holes and soil beneath.

With each succeeding course of ties going up, stagger the ties so that the ends line up over every other course. Each course should also be battered slightly into the slope. To secure into place, use six-inch spikes, toenailing at the end of each tie, three spikes along the face and two spikes along the backside of the course. For additional stability drill through two at a time with a 1/2-inch auger and drive the #4 rebars into place. This is especially important where pressure from landscape waterings and hard freezes in the winter are experienced.

In the third to fifth course of ties, deadmen should be installed. These are usually warped or badly scarred ties which go back into the bank or slope and are secured to a cross-piece tie for additional stability.

Generally, two to three more courses of ties are placed above the deadmen course. If the wall must be much higher, it is suggested that it be tiered to make handling of the ties easier and to keep the wall from being so imposing looking.

Once the wall is erected, it is a good idea to line the backside with polypropylene mesh to minimize the seeping of stone and soil through the face of the wall. Where heavy rainfall is experienced, it is suggested that perforated ADS pipe also be laid along the base of the wall to carry the excess water away.

Then begin the backfilling process, with coarse stone or gravel going against the ties for about six inches. Encase the stone or gravel in a polypropylene envelope to keep silting to a minimum. Then add backfill soil for the balance of the fill. Make sure the surface area which will be planted to landscape plants has decent soil (modified with peat moss, sand or vermiculite if necessary) to a depth of six to eight inches.

With the passage of time, the plantings mature, providing a satisfactory setting for the railroad-tie encircled landscape.

If wall building is beyond the scope of intention, other uses of railroad ties not only abound, but are far simpler in execution.

Typical tools needed:

1. Gasoline or electric powered chain saws are a necessity to save labor. Be sure to have at least one extra sharpened chain to get through a day's cuttings.

2. For wall building, the engineer's level on a tripod to make sure each course is laid level. To accomplish this objective some hacking with a mattock or axe may be necessary. If no wall is intended, then a carpenter's level will keep the ties true enough over a normal course.

3. A supply of six-inch spikes and at least 20-oz. hammers to drive them. Often three-pound sledges can accomplish the task quicker, but muscle fatigue is greater.

4. A 1/2-inch power driven auger with an extension to go through two ties, and a supply of #4 rebars. The rebars are about 1/16-inch larger than the auger, providing a "grip" on the ties.

5. The usual collection of shovels, rakes, picks and work gloves.

Beware

While used railroad ties provide a rugged and rustic appearance to the landscape, care should be taken not to ruin the effect with sloppy workmanship. Lines should be straight, courses level and the corners neat.

With some imagination, common sense and hard work, the use of used railroad ties in the landscape can be both aesthetic and functional lasting a quarter of a century or longer. **LM**

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JOHN DEERE
48

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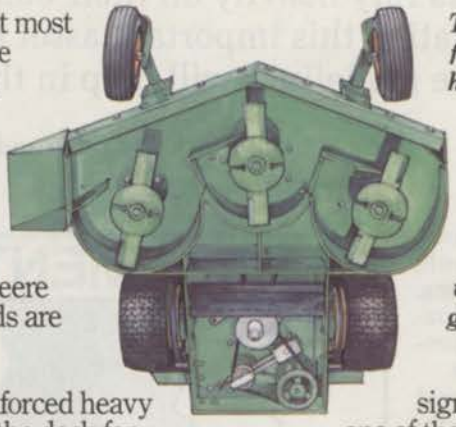

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They're also designed to give you one of the cleanest cuts in the business, too.

With a baffled under deck design that improves the airflow for less windrowing and good bagging. An overlapping blade design for cleaner cutting without stripping. Plus precise hand clutch steering for responsive turning in tight areas.

And to keep you cutting, crew after crew, John Deere's FLASH™ parts system can even get you temporarily out of stock items quickly. In most cases overnight.

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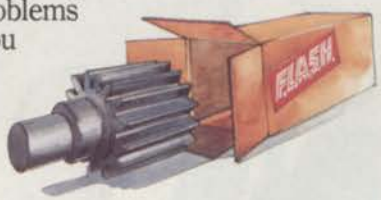

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PART I OF II

PERSONNEL EVALUATION

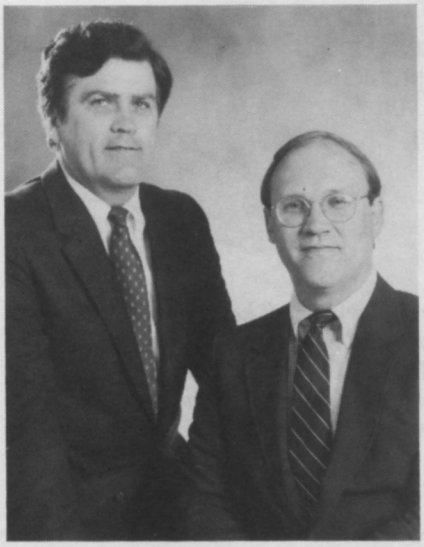
Landscape managers rely heavily on their employees for good work and good business. Evaluating this important asset is often done improperly, or not at all. These guidelines will help in the evaluation process.

by Rudd McGary and Ed Wandtke

The development of your company's personnel plan should consist of separate recruiting, interviewing, hiring, training, evaluation, compensation and career progression plans for your employees.

The development of a personnel evaluation/appraisal system for nonmanagement employees should be an integral part of a larger plan for your employees. The purpose of this system should be to answer the following questions for each employee:

- What aspects of the job performance skills does each employee have that are considered strengths of the individual?
- What aspects of the job performance skills does each employee have that are below standard and need improvement?
- How does an individual's effort on the job contribute to the company goals?
- What skills and proficiencies are needed for promotion?
- When will each employee have the competence necessary for advancement in your company?
- What will the opportunities for promotion be in your company during the next three to five years?



Wandtke and McGary are senior consultants with All-Green Management Associates in Columbus, Ohio. Dr. McGary focuses on marketing and managenent issues. Wandtke focuses on operations and financial questions.

MANAGEMENT IN BUSINESS

While it will not be possible to keep all individual subjectivity out of an evaluation system, assessing as many evaluation factors as possible on a quantitative basis will help.

The basis of successful evaluation/appraisal systems is to have all employees in a specific job rated with the same evaluation factors and comparatively scaled against each other. This is helpful as you start operating more than one location and need to identify the personnel who have the potential to be future managers within the organization.

The evaluation/appraisal system developed should include the following areas: sales, operations, administration, safety, truck and equipment maintenance, resource sharing, technical knowledge, procedures and practices, customer service and facility maintenance.

You, as the owner, know many aspects of your operation. You may also assume that all of your employees have a basic knowledge of how to perform their job. This system should help reduce assumptions on your part.

Often we hear of employers having unusual turnover, believing the problem is in the recruiting of new employees. The real problem may be that management doesn't have a consistent standard of performance evaluation and training to identify employees who need additional training to become proficient in their job. This often results in employees who do not yet have the skill proficiency needed for a job being erroneously discharged for not performing a job well. The reality of the situation may have been that they didn't have the needed training to perform the task.

In developing your evaluation system, you should decide whether an employee is skilled, needs training or doesn't need the particular skill being evaluated. Another part of the evaluation/appraisal plan should be a quantitative evaluation of the employee's job performance.

This rating should be on a scale of one to five. Five is assigned to performance significantly above expectation, four being the attainment of performance above expectation, three for meeting the job expectations, two for performance below expectation, and one for unsatisfactory performance.

This evaluation system will provide the owner/manager a comparative rating system that will identify the highest and lowest performers in the company. This ranking, together with observing the individuals, should serve as the basis for identifying your company's potential future managers, those employees needing training and those employees who need to be replaced.

Implementing a system of employee evaluation/appraisal will identify for the owner/manager those employees who have demonstrated technical competence, business understanding, sales performance, and a comparison with other employees.

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PROBLEM MANAGEMENT

by **Balakrishna Rao,** Ph.D.

Controlling crabgrass

Problem: *We are thinking of seeding a number of our client's lawns in spring. We are going to use tall fescue grass and are concerned about crabgrass problems. Is it a good idea to use Tupersan to deal with crabgrass? (Ohio)*

Solution: If it is possible, wait and do the seeding in fall around Labor Day for best results. Success in spring seeding depends upon providing sufficient water during establishment. During the slow establishment period, both grassy and broadleaf weeds present a problem in many lawns. To deal with crabgrass problems, several options can be considered.

First, seed this season but do not attempt to control crabgrass. Instead, manage the problem next year. Another choice is to use Tupersan, a pre-emergence herbicide from Du Pont, at planting time. At least 1/2 inch of water must be provided by rainfall or irrigation within three days after treatment. Tupersan is reportedy safe on newly-seeded grass. It is expensive but it will do the job.

The third option is to use post-emergence herbicides, such as MSMA (Daconate 6), DSMA or Acclaim! after the turfgrass is well-established and actively growing. All of these work well when used on small crabgrass plants. Therefore, success with this approach depends upon proper timing and good coverage. Some of these can produce foliar discoloration. Read and follow label specifications for best results.

Pine beetles

Problem: *During a severe storm, many pine trees were blown over in some of our clients' properties. Clients are concerned about pine beetle infestation. The question is how quickly will the fallen trees be infested by beetles? Will beetles move from the fallen trees to other nearby trees? How can we manage this problem? (North Carolina)*

Solution: Among many beetles, Southern pine beetles are the most destructive insect in the Southern U.S., Mexico and Central America. These beetles can build up in number very quickly and can cause extensive damage. Depending upon the latitude and elevation there may be four to seven generations per year, with overlapping generations.

During their activity period, beetles can attack all pines. Stressed or weakened plants, like the storm-damaged trees, would be more susceptible to beetle infestation. Once the beetles attack a tree, they can build up in numbers very quickly within a month. They often attack other pines nearby.

The first sign of an infestation is discoloration of tree crowns. Needles become yellowish first and then in about one to two months they turn reddish brown. Generally, pines are killed in groups of a few to several plants. Look for beetle entry point as evidenced by pitch tubes—small yellowish white resin, 1/4 to 1/2 inch in diameter.

During very dry periods, there may not be any pitch tube. Instead, only reddish boring dust can be seen. In these areas, bark trace the trunk and look for S-shaped egg galleries on wood. Sometimes eggs, larvae or even adults can be found in these galleries. Affected trees should be removed. Beetle broods in these trees can be killed by felling the infested trees and spraying the bark with lindane. It is important to spray the bark surface thoroughly, turning infested trees to cover all surfaces. Where feasible, burning of infested tree bark also gives a good control. Infested areas should be re-examined periodically for any new infestation.

Cool season weed control

Problem: *Can Surflan or Treflan be used for pre-emergence weed control in cool-season turfgrass? If so, what rates, and does anyone make a fertilizer/herbicide combination available to turfgrass managers for professional use? (Ohio)*

Solution: Yes, Treflan is available in combination with Balan for pre-emergence annual grassy weed control on cool-season turfgrasses. This combination product is called "Team," manufactured by Elanco Company. Apply two to three pounds active ingredient per acre to manage annual grassy weeds. Team is a granular product. It is available in several fertilizer combinations from Lebanon Chemical Company. Read and follow label specifications for best results.

Balakrishna Rao is Director of Lawn Care Technical Resources for The Davey Tree Co., Kent, Ohio.

Questions should be mailed to Problem Management, Landscape Management, 7500 Old Oak Boulevard, Cleveland, OH 44130. Please allow 2-3 months for an answer to appear in the magazine.

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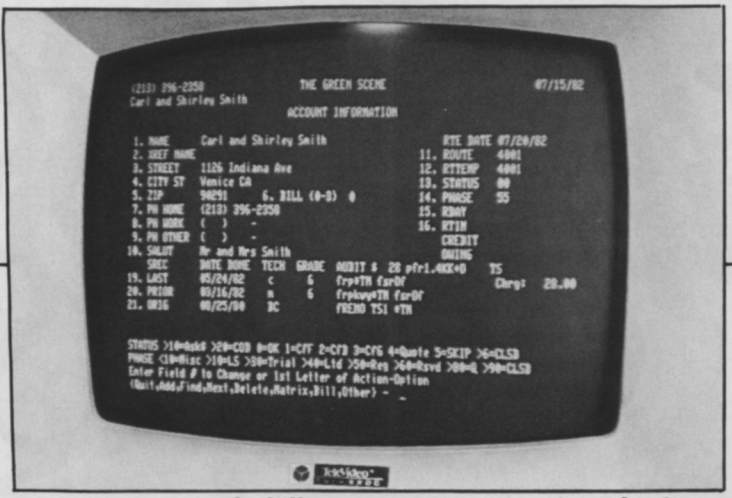
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A computer can make billing customers easier. A good software program provides easy access to information on customers.

COMPUTERIZING CAREFULLY

Thinking of computerizing your business? Here's some tips to follow before investing money.

Computerizing may help ease business management, but it takes time and money to get it under way.

"To say one system is best is inappropriate," says Sally Kujawa, vice president of Kujawa Enterprises in Cudahy, Wisc. "There is no state-of-the-art in the computer world."

Kujawa says the lifespan for a system is three to five years. "You change not because it break downs, but because computer technology changes so rapidly," Kujawa says.

The first step in choosing a system is to appoint a committee, says Kujawa. That may mean a committee of one—you.

The next step is to appoint a chairman of the committee. The chairman's job is to investigate the company's needs. The function of a computer system is to provide management with a tool and to crunch numbers.

The chairman can ask questions of employees: Is the company losing money because bills aren't sent on time? Is there a way to track past-due accounts? Are there calculation errors? What the chairman reports will influence the type of software chosen.

The chairman should read through magazines and books to completely understand the way software and hardware fit together to form a system. Companies with different needs require different types of systems.

"A great benefit of computers is their ability to rearrange the facts stored in their memories," Kujawa says. "With the spreadsheet software available today, it is a simple process to analyze sales, profit centers, cash flow, customers, vendors and almost anything else you choose."

When choosing software, pick a software that will fit your hardware system. If you don't already have hardware, check your software needs first. Make sure it can fit within the budget. Get a system the staff can operate easily and will work with the company's future needs.

All office procedures are integrated to some extent. Therefore, choose a software program that can be integrated. "You'll find a lot of packages which will do 85 to 90 percent of what you're asking," Kujawa says. "That's a good match. I doubt if you'll find 100 percent."

When buying software, Kujawa says to always stick with the brand name. Go to a reputable software/hardware dealer. Once you know about software, ordering by mail through software magazines can save money.

Kujawa says four points should be kept in mind no matter what system you choose:

- Software should be well documented, with easy-to-follow instructions. It should be backed by training and duplicate copies should be available at little cost.
- Hardware should be well-built with an easy-to-read screen and little glare.
- The keyboard should be standard typewriter arrangements with well-marked function keys.
- The system should be expandable by adding external memory, screens, printers and programs.

A good printer is a must, says Kujawa. Choose carefully from the three types available: matrix, laser or daisy-wheel. A laser is necessary for desktop publishing of sales literature or newsletters, while a daisy-wheel works slowly like a typewriter.

A good personal computer will allow for expansion in the memory and will do graphics.

"There's no such thing as a $500 computer," Kujawa says. "$5,000 is a good beginning budget." That, of course, includes hardware, printer and software.

Kujawa says one thing to remember in choosing a computer is that it probably won't cut back on hours. If the bookkeeper spends three hours working now, it will still take three hours to input information into the computer.

She also warns that computers don't eliminate paper, but generate more paper. Converting from a manual operation to a computer system takes time. Kujawa says it's best to input receivables first, then accounts payable, then payroll.

"I can't stress enough to give yourself plenty of time," she says. **LM**

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RESEARCH UPDATE

Giant must awaken and smell the coffee

by Kent W. Kurtz, Ph.D., Cal Poly-Pomona

The sports turf profession in the United States, with the exception of golf, has not been overly active in funding or conducting research for the improvement and development of safer natural grass surfaces. Many ideas, techniques and cultural practices currently used to maintain sports turf can be traced to research originally funded by the golf course industry.

Sports turf research in the United Kingdom has been very successful and productive. The Sports Turf Research Institute (STRI) located in Bingley, England, is an example of a cooperative effort that has made significant contributions to the sports turf industry.

Several sports-related oganizations, including golf, have joined in an effort to conduct research for the betterment of the industry. These groups provide the guidelines and funding, and the results of the research are shared by the total industry. The sports turf industry here in the United States could learn a great deal from our colleagues at the STRI, and observe the manner in which these professionals go about their research activities and cooperate in the implementation of the results.

Turf research

Even though research on sports turf has not kept pace with other areas in the turfgrass field, several significant contributions and applied projects are worth mentioning.

Field paints and colorants. It is now possible to wipe out an old logo or endzone name, paint in the new one and not have to wait for grass seed to germinate and grow in to cover over the old paint.

An opaque paint is used to cover the old paint and the new color is applied over the same area. This is done using natural earth colors and pigments, i.e., burnt and raw sienna plus white paint—colors that change the area to look like dormant grass when they are applied correctly and alowed to dry.

Colorants can look natural. Several turfgrass colorants are on the market but very few have true natural grass green colors. One developed in California is so close to the natural green that it can't be detected easily.

These colorants are used in climates where natural grass goes dormant or in situations where weak spots develop in cool-season grasses and a cosmetic touch-up is necessary. These colorants consist of blue-green pigments resembling the true color of Kentucky bluegrass. They are colorfast, and will not rub off on player uniforms.

Pre-germinated seed. Turfgrass seed is pre-germinated to encourage faster establishment, particularly when time is a factor or where cold weather may increase the germination time. Different methods of seed pre-germinations are used by professional field supervisors at major stadiums to accelerate the growth of perennial ryegrass and Kentucky bluegrass.

A senior project by Nicholas Spardy at Cal Poly University-Pomona evaluated all the known methods of seed pre-germination. Each of the methods produced viable seedlings, though some were slower than others. Here is the procedure found superior:

Perennial ryegrass seed is taken out of the seed bag and placed in a large container of water. The water is changed every six hours and air is bubbled through the hose continuously using an air hose placed in the bottom of the container. The oxygen in the air replaces the carbon dioxide which is given off by the respiring seed; the constant oxygen supply increases the metabolic process in the seed and it germinates more rapidly. Within seven days more than 90 percent of the perennial ryegrass seed had germinated and green leaves 1¼ to 1½ inches long were visible on the seed.

Once the seed has germinated it can be mixed with a carrier such as medium-to-fine sand or an organic material and then distributed onto a prepared surface on the playing field (surface can be vertical mowed, sliced or aerified).

Once the pre-germinated seed is placed onto the field it can be top-dressed with sand or an organic material and kept moist until well established.

Seed Combinations for the Transition Zone. In order to achieve faster spring green-up, produce a wear-tolerant athletic surface and extend green color later into the fall season, combination seedings using seeded zoysiagrass and tall fescue show great promise.

Jack Murray at the U.S. Department of Agriculture at Beltsville, Md. feels that seeded zoysiagrass (1 lb./1000 sq.ft.) combined with the new turf-type tall fescues (2-3 lb./1000 ft.) and grown and sold as sod may meet the needs of many sports field managers, particularly in the transition zone.

Rose Bowl field supervisor Richard Gonzales (left) and the author examine the turf at the Rose Bowl after a geotextile was used to protect it from fans at a Bruce Springsteen concert.

Field Warming Covers. The introduction of field warming covers has made the job of establishing new seedings faster and easier. Several companies have introduced covers made of either polyester or a plastic material. Purpose of the cover is twofold: to accelerate seed germination or the spread of stolons and to increase the soil temperature for better turfgrass establishment. They can also be used to prolong green color on warm-season grasses in the fall or to bring dormant turf out of winter dormancy sooner.

These new covers are superior to the polyethylene materials used in the past. They are easier to spread out on a field surface, and they can be reused several times because the ultraviolet rays from the sun will not crack the material.

Research conducted at both Cal Poly-Pomona and at the Rose Bowl indicates a soil temperature increase from seven to 15 degrees Fahrenheit compared with a surface not covered.

continued on page 76

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TAKING A TOLL

Tolls from the Ohio Turnpike take a toll on weeds and otherwise help keep the east-west byway looking sharp.

Danon Kramp and Dan Castrigano have the best of both worlds. They not only are responsible for maintaining 241.2 miles of roadside vegetation, they also have a nice budget—a total of $20 million—to do it with.

How do they come by so much financing? Because the road they maintain happens to be the Ohio Turnpike, a smartly-kept toll road through northern Ohio that joins on the east with I-80 in Pennsylvania and on the west with the Indiana Toll Road.

They've divided the highway into eight zones of about 30 miles. Each zone uses three or four tractor units, Brouwer five-gang reel mowers that have 11-foot swaths, and 30 employees.

Castrigano, with the Ohio Turnpike Commission since 1982, says, "We mow before the grass is six inches high. That means an average of 11 to 13 mowings per year.

"We pride ourselves on the appearance of the zones. We're trying to have a golf course fairway look on the medians."

Among the herbicides they use to try and control growth are PBI-Gordon's Embark plus 2,4-D and Monsanto's Manage plus Du Pont's Oust. They're thinking about testing Du Pont's Telar, with which Indiana and Michigan have had good results. The Embark/2,4-D combination was applied in early May last year. "We were fairly pleased with what we saw," admits Castrigano, "no growth until September."

Augmenting the PGR applications and mowing are applications of Spike and Surflan from Elanco Products for weed control under guardrails, which they have used since 1981. Du Pont's Krovar may be tested soon.

One of the biggest problems they encounter are cattails in ditches.

This spring, they planned to implement herbicide spraying on shoulder and back slopes at interchanges. (They define shoulder slopes as "asphalt to ditch" and back slopes as "ditch to fence.")

Most herbicide applications are contracted, but hydroseeding jobs aren't. The O.T.C. has two large 1200-gallon hydroseeders that it uses.

Gravely tractors are used to mow around service plazas and ramps to the plazas. All plazas are treated with insecticides and Vertac's Dowpon M broadleaf weed control. During the summer, college students are also hired for weeding at plazas and interchanges.

Kramp and Castrigano work well together. She with a degree from Ohio State University in horticulture, and he with a degree from the University of Toledo in civil engineering. She on the road most of the time (68,000 miles in the last two years) and he behind the desk (except for special maintenance projects). And both enjoy what they do.

"I'm not a desk person," claims Kramp, who is a certified pesticide applicator in Ohio, like two other O.T.C. employees. "I like being outside."

"I enjoy my job," adds Castrigano. "I get involved in a lot of different aspects of highway management."

One of the biggest problems they encounter are cattails in ditches. They have used Monsanto's Roundup in the past, and are considering testing Rodeo. Another is plumegrass in ditches and slopes where there's a lot of moisture. Dowpon is used, but is sometimes ineffective.

Of the $20 million budgeted the department, about five percent is used on mowing and spraying. Another 10 percent is used for control of snow and ice, which is a heady problem in this part of the country.

Pre-treated sodium is used when the snow falls: solid sodium chloride with liquid calcium chloride, which works more effectively in lower temperatures. All winter, weather reports are monitored six times a day. When a possible snowfall exists, crews are halved with each crew on duty 12 hours a day.

"With a heavy snow, we actually put some men up in hotels close to the turnpike," notes Castrigano. "There are no complaints. We have dedicated employees; when we have a heavy snow, they rise to the occasion." **LM**

Danon Kramp and Dan Castrigano are the Ohio Turnpike Commission's version of "Ms. Outside and Mr. Inside."

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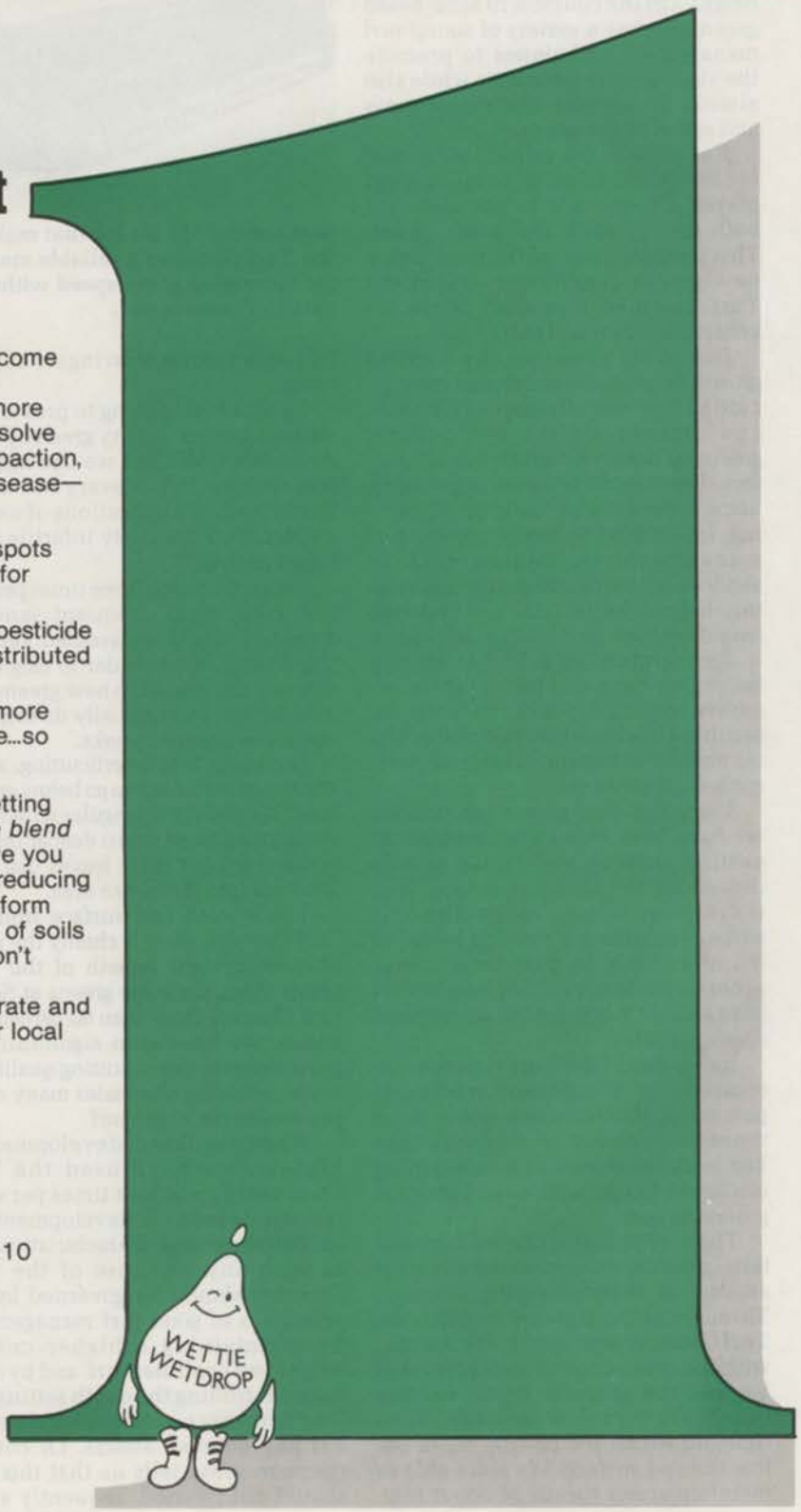
- Saves water costs by 30-50% because more water uniformly penetrates the root zone...so plants get more and you waste less.

A patented blend of non-ionic organic wetting agents, AQUA-GRO *is the only 100% active blend of wetting agents available.* We don't believe you should pay for water. AQUA-GRO works by reducing water's natural tensions, ensuring more uniform penetration and drainage through all types of soils and thatch. AQUA-GRO lasts because it won't leach.

AQUA-GRO is available in liquid concentrate and spreadable granular formulations from your local distributor.



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Circle No. 103 on Reader Inquiry Card

New turf 'groomer' keeps greens healthy

by Bill Webster

Seattle Golf Club wanted it all: faster greens for members and healthy turf, which means not lowering the cutting height. On the course's 19 sand-based greens, we use a variety of sound turf management techniques to promote the vigor of turfgrass plants while also aiming to improve the smoothness and speed of the green.

But in 1986, we introduced a new technique called grooming that played a major role in our quest for both green health and green speed. This grooming was performed with a new greens conditioner, called the Turf Groomer, a product of the Jacobsen Division of Textron Inc.

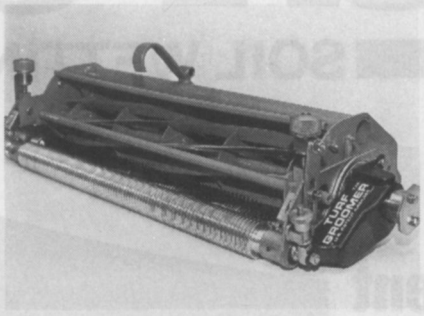
Grooming promotes the vertical growth of grass and eliminates grain by cutting horizontally-growing grasses and runners. Unlike verticutting, grooming does not disturb the soil surface. The material removed in grooming helps control thatch build-up. Grooming, in addition to many proven turf management techniques such as aerification, verticutting and topdressing, helped us to raise our mowing height without sacrificing green speed.

By maintaining a higher cutting height, we have also increased the effective rooting depth of the turfgrass, resulting in a healthier turf that is better able to withstand wear and environmental stresses.

Using the new greens conditioner, we have been able to get a smoother putting surface and faster speeds thoughout the summer season, and we've been able to accomplish this while maintaining a mowing height of 5/32 of an inch. In past years it was necessary to lower cutting height to 1/8 of an inch or less to get the same speed characteristics.

Initial use of the Turf Groomer increased our Stimpmeter reading 11 percent. It also removed nearly three times the amount of clippings than had been removed by double-cutting at a lower height with a conventional greens mower.

These clippings included horizontally-growing grasses as well as a great amount of thatch-forming biomass. Throughout the summer months, the Turf Groomer was used twice a week, with the greensmower bedknife set at 5/32 and the groomer depth varying from 1/16 to 5/32 below bedknife. At no time did we set the cutting depth below the soil surface. We were able to maintain green speeds of about nine feet with a single mowing six days per week.



Some of the 522 blades that make the Turf Groomer a reliable means for increasing green speed without cutting greens lower.

No one tool is going to provide you with a superior quality green by itself. At Seattle Golf Club we use light but frequent (as often as every two weeks) liquid feeding applications of various nutrients on the fairly infertile sand-based greens.

We aerify two to three times per year and apply light, frequent sand top dressings. While we avoided verticutting during 1986 in order to effectively evaluate the use of the new greens conditioner, we will normally do this once every two or three weeks.

Grooming is not verticutting, as the knives are not meant to go below ground level. We maintain a regular schedule of verticutting to get down deeper into the turf and get out older leaves that have subsided into the crown area.

The smooth turf surface from the Turf Groomer's use is chiefly the result of more upright growth of the grass plants. Also, since the greens at Seattle Golf Club are more than 90 percent poa annua, we have seen significant improvements in green putting quality because grooming eliminates many of the poa seedheads in the turf.

When seedhead development is highest, we have used the Turf Groomer three to four times per week to control seedhead development and get better putting characteristics. Just as with any tool, use of the Turf Groomer should be governed by the principles of good turf management. By maintaining a higher cutting height and healthier turf, and by carefully controlling the depth setting, the Turf Groomer can be used often without any adverse effects. Of course, common sense tells us that this tool should not be used frequently at aggressive settings during periods of environmental stress.

The Turf Groomer is a new product, so machine operators need to be educated in its proper use.

The first point to make is that the Turf Groomer is for use above soil level, and the verticutter remains the tool of choice for deeper penetration into the soil. While grooming does provide some of the benefits of verticutting and can be used to reduce the frequency of verticutting, it was never intended to replace the practice.

Another consideration is visual inspection of greens prior to mowing. This has always been of prime importance in order to reduce wear and tear on reels, but it becomes even more critical when using the Turf Groomer.

Debris such as rocks or spikes can bend the blades. If a blade is bent, the bent tip should be removed before damage is done to the roller. The loss of a few blades does not affect the performance of the groomer; there are 522 blades on the powered shaft.

Use of the Turf Groomer can increase the efficiency of the turf maintenance crew in a number of ways.

Since grooming works while you mow your greens, no additional labor costs are associated with it other than the time needed to change depth settings on the machine. Also, the grooming technique can easily be used on tees, which are often neglected due to labor limitations. Grooming immediately before topdressing applications increases their effectiveness. With two triplex greens mowers equipped with Turf Groomers, we are also able to adjust consistency from green to green.

Rather than simply increasing the speed of every green, we are grooming some greens more and others less in order to get a consistent green speed throughout the entire course. After more than a year of using the Jacobsen Turf Groomer, Seattle Golf Club members, Dr. Roy Goss of the Western Washington Research and Extension Center at Washington State University and Larry Gilhuly of the USGA Green Section have all had very favorable comments regarding the condition of the putting greens at the course. All agree that the grass density is as good as they have seen it in the past 10 years.

Webster is superintendent at Seattle Golf Club, Seattle, Wash.

Imagine what it might look like with Nutri-Kote® Plus Apron® coated seed.

Photograph Courtesy NASA

Nutri-Kote® Plus Apron® coated seeds are delivering dramatic results for turf professionals nearly everywhere.

Even when the soil, weather and traffic conditions are less than perfect, every Nutri-Kote Plus Apron coated seed has a much better chance of reaching maturity compared to uncoated seed.

The unique combination of nutrients, micro-nutrients and the systemic fungicide Apron controls pythium and other seedling diseases. Turf establishment is much faster than uncoated seeds. Root development is greatly enhanced. There's more lush green growth. And seeds stay where you plant them.

Discover for yourself what turf professionals at golf courses, stadiums, parks, and municipalities across the country are finding out. That Nutri-Kote Plus Apron coated seed produces healthier, better-looking turf. And we're not just promising you the moon.

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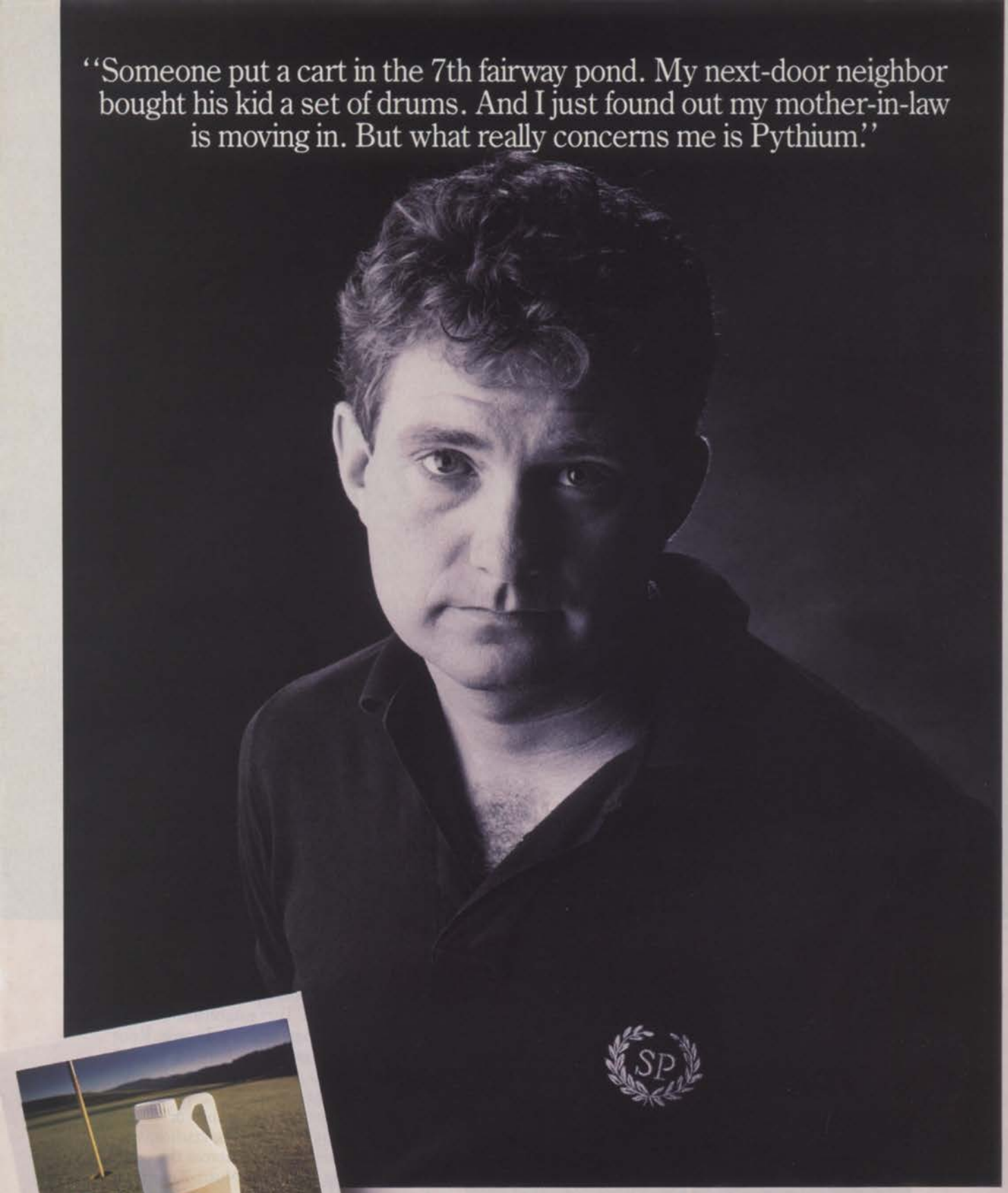
Circle No. 106 on Reader Inquiry Card

6-2725

"Someone put a cart in the 7th fairway pond. My next-door neighbor bought his kid a set of drums. And I just found out my mother-in-law is moving in. But what really concerns me is Pythium."



There's one sure way to avoid worrying about Pythium. Use Subdue® fungicide. Subdue stops Pythium on contact. Once absorbed by grass roots, Subdue protects your turf against further attack for up to three weeks. So don't let Pythium get you down. Get Subdue. Because you've got other things to worry about. CIBA–GEIGY

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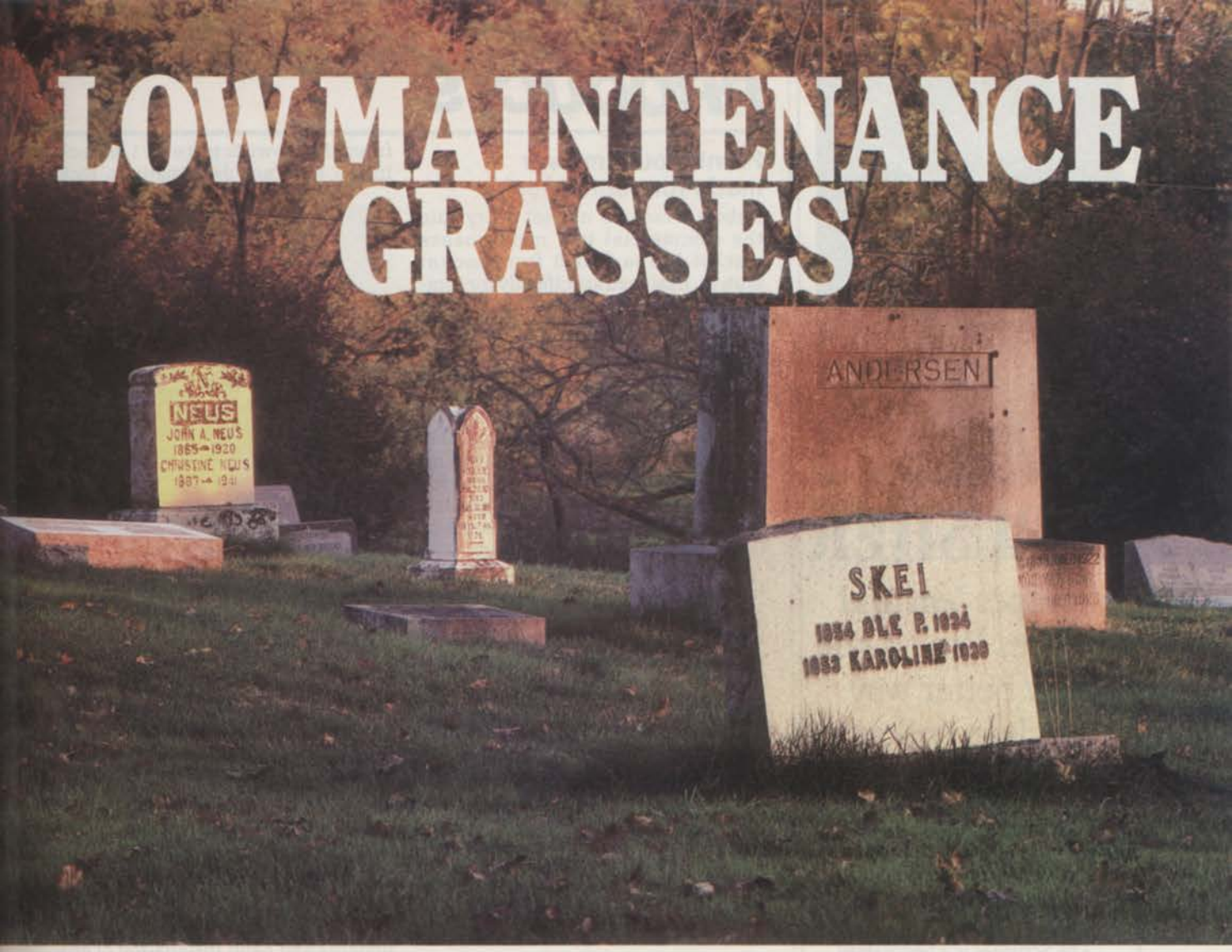

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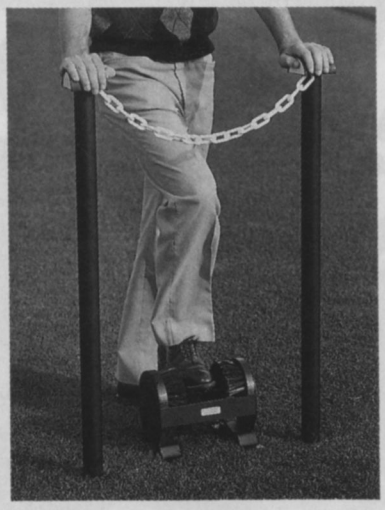

SCRUSHER

Scrapes 'em and brushes 'em . . . the new better way to clean spikes and shoes.

The Scrusher is a must around heavy traffic areas like the clubhouse, locker room entrance, or pro shop. It keeps dirt in its place — outside!

The Scrusher is a heavy duty brush that cleans spikes and sides of the shoe at the same time. The lower brush has three rows of stiff nylon bristles to thoroughly clean spikes. Spaces between the rows of brushes allow grass and dirt to fall through and help keep brushes free from clogging. Side brushes are softer nylon bristle that won't scratch shoes. All brushes are replaceable. Can be mounted on turf or concrete. Posts, chain and mounting spikes optional.

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SG-148

Circle No. 146 on Reader Inquiry Card

PRODUCTS

Front mount mower made for contractors

Kubota Tractor's newest entry into the commercial turf maintenance market is the F2000 front mount mower. Designed specifically for commercial use, estate landscapers and homeowners, the F2000 is equipped with a 20 hp liquid-cooled diesel engine, four-wheel drive, differential lock, rear-wheel steering, hydrostatic transmission and power steering.

Kubota's hydrostatic transmission, teamed with the four-wheel drive and front differential lock, allow for smoother operation on terrain too steep or traction too slick for conventional two-wheel drive mowers.

The F2000 has good visibility and infinite forward travel speeds to 9½ mph. A 60-inch deck is standard, though an optional 72-inch mower is in production. Mowing heights are adjustable from 1½ to 4 inches.

Circle No. 190 on Reader Inquiry Card

Tree injector applies chemicals through trunk

A new tool for injecting chemicals into tree trunks has been developed by Advanced Plant Management. The injector has a manually operated piston pump and is certified as a

"closed system" by the California Department of Food and Agriculture.

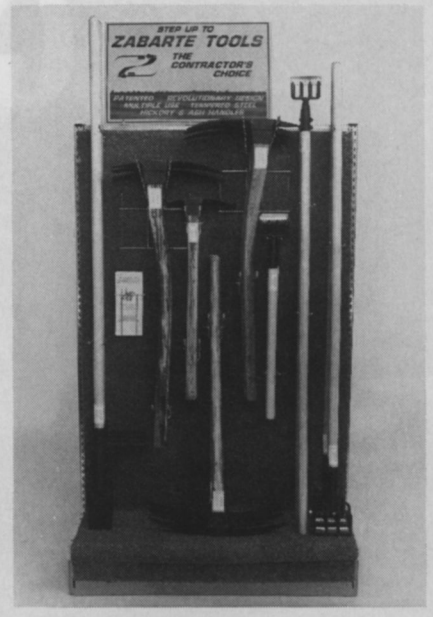
The storage reservoir holds up to 470 milliliters, allowing for numerous injections before refill is necessary. A pressure gauge informs the operator when the injection process is complete. An auxiliary hose and tip allow for injection into inaccessible areas.

Circle No. 191 on Reader Inquiry Card

New striking tools, cultivators unveiled

A new line of striking tools and cultivators is available from Zabarte Industries. The tools feature northern ash or hickory handles, and can be used for a variety of ground preparation practices for planting.

The tools are lightweight, ranging from 7 lbs. down to just over 1 lb. Tools in the line include a mattock, pick,



scraper/weeder, planter, trencher and others in various sizes.

Circle No. 192 on Reader Service Card

Staple gun eliminates hand installation

North American Green's new Surelock Staple Gun is designed to end stooping and hand installation of erosion control fabric while holding the fabric firmly in place.

The Surelock is an upright staple gun with a foot operation pedal. The handle is adjustable to the operator's height. Its cartridge chamber is enclosed to keep dirt out. Each cartridge holds 100 staples.

Circle No. 193 on Reader Inquiry Card

Continued on page 74

SPECIAL ANNOUNCEMENT

Good News About TERRANEB SP.

It's Now Proven Effective for Brown Patch and Sclerotium Blight on Turf Grasses.

Terraneb SP is now available for control of Brown Patch and Sclerotium Blight. Used for years to control Pythium and Gray Snow Mold, Terraneb is now the only product you need to fight the four most common turf diseases.

TOP:
Sclerotium Blight on Kentucky Bluegrass.
BOTTOM: Sclerotium Blight on Bentgrass green.

Brown Patch: The Most Common Turf Disease.

All commonly grown turfgrasses—especially bentgrasses—are susceptible to Brown Patch. It can destroy a stand of bentgrass within a few days.

Prevalent during extended periods of high temperature and humidity, Brown Patch is also encouraged by poorly drained soil, lack of air circulation and excessive nitrogen. In its early stages it appears as a circular area of light brown grass, from a few inches to several feet long. A grayish-black smoke-ring band up to two inches wide will be visible, especially in the early morning, on the edges of the affected grass. The circular areas grow and turn brown. Brown Patch is best controlled with a combination of dethatching, good drainage and air circulation, avoiding overfertilization and **TERRANEB SP.**

Hot and Humid Sclerotium Blight.

Also called Southern Blight, Sclerotium attacks annual bluegrass, Kentucky Bluegrass, ryegrass and bentgrass in all sections of the country, from the west in early spring to the east in early summer. The fungus begins to spread from the soil and surrounding debris to the grass during hot, humid weather.

In its early stages, Sclerotium Blight has a frog-eye appearance, with small, circular dead areas with tufts of apparently non-diseased grass. The circles may grow up to three feet in diameter.

Apply **TERRANEB SP** during periods of high temperature and humidity to prevent Sclerotium Blight.

Control the Big 4 with TERRANEB SP.

Now there's no need to keep several different fungicides on hand. **TERRANEB SP** now controls Brown Patch, Sclerotium Blight, Pythium and Snow Mold. Simple to use, **TERRANEB SP** provides fast-acting control and its time tested, biodegradable formula, with low toxicity, requires lower use rates than other products. The systemic action of **TERRANEB SP** controls fungus growth and protects grass when the heat and humidity make it most vulnerable.

Time Tested
TERRANEB SP
TURF FUNGICIDE

For further information, write:

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or call your local distributor.

Circle No. 121 on Reader Inquiry Card

Pump prevents spillover when filling gas tanks

The "Tommy Pump," distributed by Mason & Assoc., is designed to transfer liquid from one container to another without spillage or lifting heavy cans. It fits most metal gas cans and designed to become a permanent fixture on the fuel can.

It is approved for use with gasoline, kerosene, diesel fuel, hydraulic fluid, oil, water, antifreeze, 90-weight gear oil and automatic transmission fluid. It also has a 12-month limited warranty.

Circle No. 194 on Reader Inquiry Card

Transporter 1st entry into utility market

The AMT 600 all material transporter is the first entry by John Deere into the utility vehicle market. The five-wheel cargo carrier has a capacity of 600 lbs. and is powered by an 8.5 hp engine featuring variable speed drive for speed control up to 20 mph.

The cargo box sits above the four rear wheels for better stability. The box is 48¼x43x11 inches. The tailgate

can be removed and the box dumped manually. Flotation tires inflated to six psi minimize ground compaction. The unit can fit in the back of a standard size pickup truck for easy transport between job sites.

Circle No. 195 on Reader Inquiry Card

Dripless attachment tools are quick connecting

Power Spray Technology, Inc., offers a line of attachment tools for use with all standard spray equipment. The dripless soil rod features an on/off valve and six-hole lateral dispersion. A 32-inch dripless step-on sub-slab injector features a heavy duty welded foot step and a nylon back-splash preventive guard. A 12-inch standard dripless sub-slab injector features a nylon back-splash preventive guard. The step-on root feeder features a heavy duty iron welded foot step, on/off valve and six-hole lateral dispersion.

All tools feature an in-line automatic chemical shut-off, assuring the operator that chemical in the rod and handle will not run when the valve is turned off, and quick-connect cadmium plated steel couplings.

Circle No. 196 on Reader Inquiry Card

Valve performance shows reduced pressure loss

UltraFlow valves from James Hardie Irrigation feature straight-through water flow paths for low pressure loss over wide flow ranges.

The valves feature adjustable flow control and a non-corrosive sealed solenoid. The valves come in three sizes and have a five-year

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The Goossen Bale Chopper -

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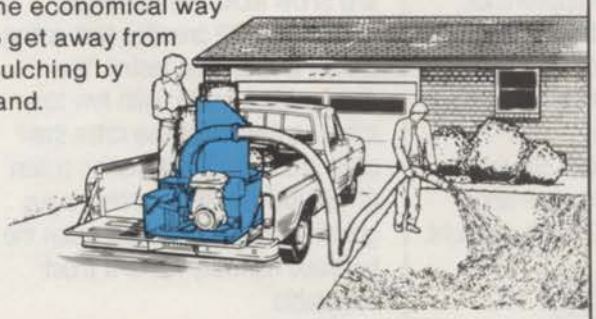

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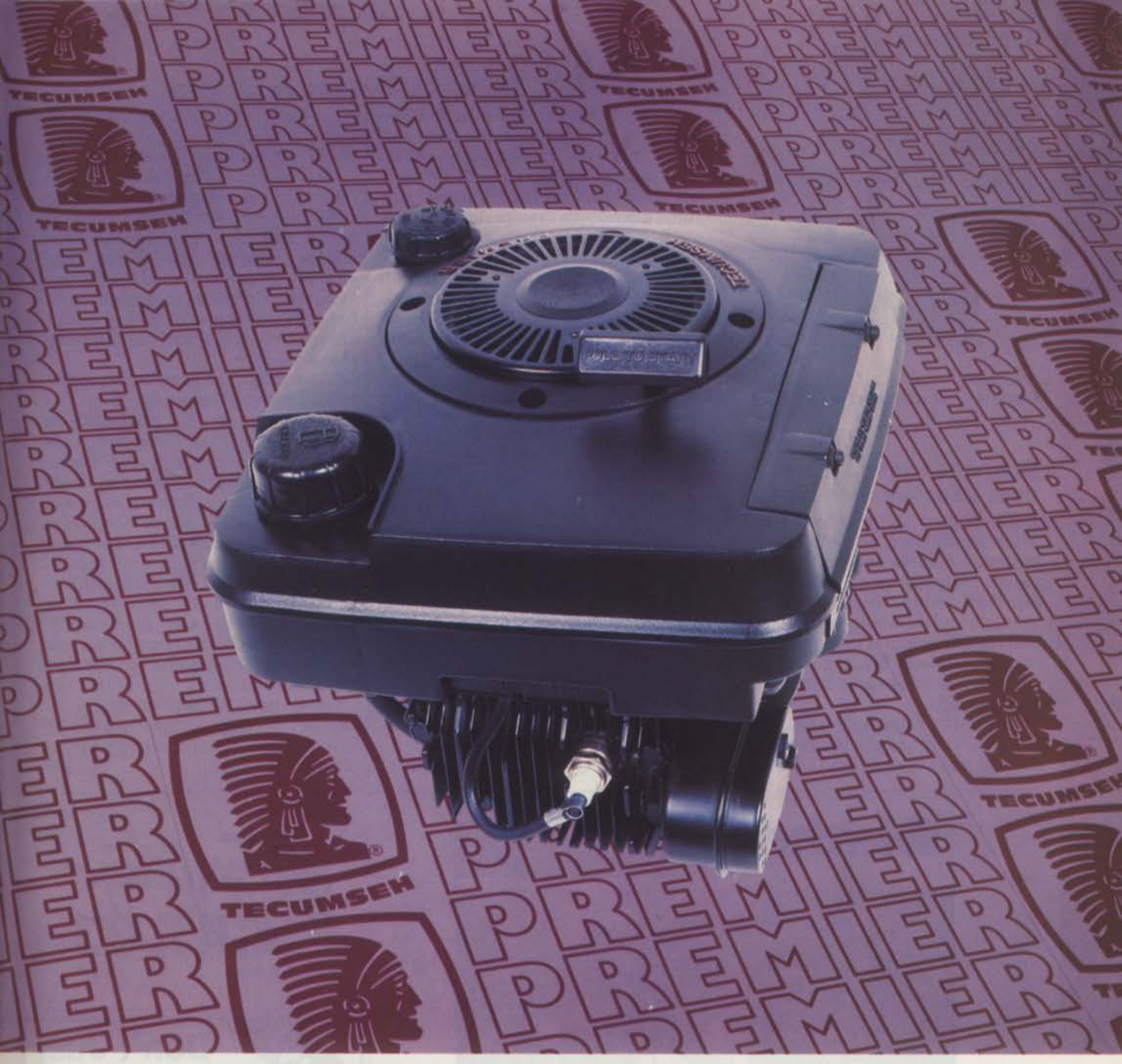

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PREMIER XL XTRA LIFE (Industrial/Commercial)

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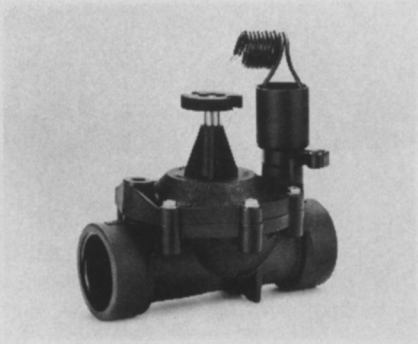

warranty.
Circle No. 197 on Reader Inquiry Card

Drainage system more cost-effective than pipe

Drain-It, manufactured by American Wick Drain Corp. for Atlantic Construction Fabrics, is a new prefabricated, highway-grade drainage system that combines high flow capacity, strength and durability with economical installation. It is designed for golf courses, athletic fields, parks, building grounds, bridge abutments and retaining walls.

Drain-It's high flow capacity results from the use of a multi-channel, formed polyethylene core covered by a polypropylene fabric to prevent clogging. According to the company, the non-woven, needle-punched fabric also allows water entry over 95% of its surface for up to 35% higher volume drawdown than perforated pipe.

It is one inch thick and weighs 8 oz./sq.ft. Sections can be joined using duct tape and a utility knife. Drain-It features a core crush strength of 8000 psi to withstand the pressures of backfilling and compaction during installation without loss of flow area. Drain-

It comes in rolls of 100 and 150 feet in six, 12, 18 and 24 inch depths.
Circle No. 198 on Reader Inquiry Card

UPDATE *from page 64*

In cool environments this could mean the difference between seed germination and no germination.

Studies at Cal Poly-Pomona reveal that within 14 days perennial ryegrass seedlings were eight inches tall compared with 2½ inches tall where covers were not used. When used with pre-germinated seed the success of faster turfgrass establishment is enhanced, particularly where a balanced starter fertilizer was placed in the seedbed.

Geotextiles. The introduction of fabrics collectively known as geotextiles has greatly reduced the wear factor on many athletic fields. These covers are made of 100 percent polyester needle-punched, non-woven fabric that resists heavy traffic. They allow air, water and sunlight to pass through the fabric so the grass can carry on its normal functions.

Major stadiums have used geotextiles to protect turf from concerts, circuses and events that require thousands of chairs for field seating. When used as bench tarps for players to stand on during football games they have miraculously preserved the grass surfaces. Without the geotextile covers the turfgrass areas would be ground into soil, sand, mud and grass plant parts. **LM**

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MODEL 986. Compare its 42" diameter drum, hydrostatic drive for variable feed speed, 15° curbside angle for operator safety and 360° swivel chute. Gas or diesel — you'll buy Olathe.

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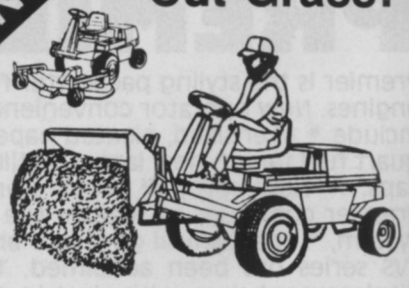
San Antonio
PLCAA/87
NOVEMBER 12-15, 1987

New!

Don't Just Cut Grass!



Get 10 times the work year-round from your mower with the fast, easy to use, power raise and dump Auto-Dump™ loader! Changeover in minutes with no additional hydraulics.

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A New Turf Care Formula!

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VORLAN™ is the product of choice by superintendents, professional lawn care operators and landscapers for the control of Leaf spot, Dollar spot, Red thread and Pink snow mold.

FUNGO® is the standard for control of the ever increasing problems of Brown Patch and Anthracnose.

This tank mix affords you the unequaled disease control, plus, the economy of a single spray at reduced rates.

A one ounce each application of VORLAN and FUNGO tank mix can prevent these six major diseases.

1. Leaf spot
2. Melting out
3. Dollar spot
4. Brown patch
5. Red thread
6. Anthracnose

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FYLKING
KENTUCKY BLUEGRASS
U.S. Plant Patent 2887

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EVENTS

JULY

The American Cemetery Association University, July 13-17, Memphis State University, Memphis, Tenn. Contact: American Cemetery Association, 5201 Leesburg Pike, Suite 1111, Falls Church, VA 22041; (703) 379-5838.

American Association of Nurserymen 112th Annual Conference and Industry Exposition, July 19-21, Amway Grand Plaza and Grand Center, Grand Rapids, Mich. Contact: AAN, 1250 I Street N.W., Suite 500, Washington, D.C. 20005.

Kansas Turfgrass Field Day, July 22, Kansas State University, Manhatten, Kan. Contact: Larry D. Leuthold, Horticulature Dept., Waters Hall, Kansas State U., Manhattan, KS 66506; (903) 532-6173.

International Lawn, Garden and Power Equipment Expo '87, July 27-29, Commonwealth Convention Center and Kentucky Fair & Exposition Center, Louisville, Ky. Contact: Show management office, P.O. Box 70465, Louisville, KY 40270; 800-558-8767 or (502) 582-1672.

Association for the use of Native Vegetation in Landscapes seminar, July 21-23, Purdue University, Lafayette, Ind. Contact: Ray Freeborg, Ph.D., ANVIL, 871 Shawnee Ave., LaFayette, IN 47905.

Fourth annual International Lawn Garden and Power Equipment Expo, July 27-29, Louisville, Ky. Contact: Polly Moter, P.O. Box 70465, Louisville, KY 40270; (800) 558-8767.

Missouri Turfgrass Field Day, July 28, UMC South Farms, Columbia, Mo. Contact: Dr. David Minner, Dept. of Horticulture, University of Missouri, Columbia, MO 65211; (314) 882-7511.

Penn Allied Nursery Trade Show, July 28-30, Valley Forge Convention and Exhibit Center, King of Prussia, Pa., Contact: Pennsylvania Nurserymen's Association, 1924 N. Second St., Harrisburg, PA 17102; (717) 238-1673.

ASPA Summer Convention & Field Day, July 29-31, Westin Hotel, Seattle, Wash. Contact: Douglas H. Fender, American Sod Producers' Association, 4415 W. Harrison, Suite 309-C, Hillside, IL 60162; (312) 449-2890.

AUGUST

Rutgers Turfgrass Research Field Day, August 11, Rutgers Soils and Crops Research Center, Adelphia, N.J. Contact: Henry Indyk, Ph.D., Soils & Crops Department, Cook College, New Brunswick, NJ 08903; (201) 932-9453.

International Society of Arboriculture 63rd Annual Conference, August 16-19, Keystone, Colo. Contact: International Society of Arboriculture, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801.

Association of Zoological Horticulture Annual Conference, August 17-21, The Calgary Zoo, Alberta, Canada. Contact: Don Peterkin, Calgary Zoo, Box 3036, Station B, Calgary, Alberta Canada T2M 4R8.

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ServiceMaster LawnCare Operator
Hutchinson, Kansas

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Rick White

Rick White
Vice President
ServiceMaster LawnCare

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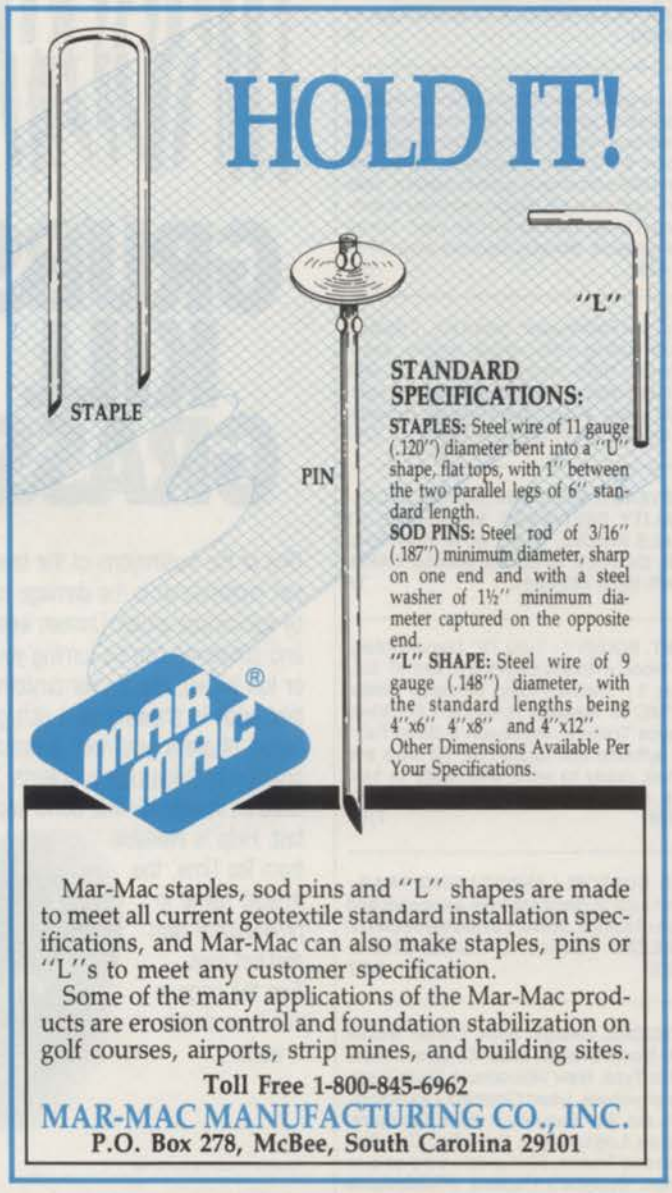
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REPS WANTED

MANUFACTURERS REPRESENTATIVE: Denver Leasing and Manufacturing, a major supplier of spray trucks, parts, and accessories for the lawn and tree care industry is seeking qualified manufacturers reps to represent our high quality product lines in multi state territories. Interested persons should send resume to Personnel Director, 6803 Joyce St., Golden, CO 80403. 7/87

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. . . . dust to dust

The dried, cracking ground crumbled slightly under the weight of the man's boot. He stopped and knelt down, running two fingers of his right hand over the dry ground. He tugged at a couple blades of grass. The drought-stressed turf tore easily. The man could irrigate his greens and tees for a short time each day, but his fairways. . . .

Is this scene reserved for the arid Southwest? Or the Southeast, tortured by drought last year? For the moment, perhaps, it seems that way. But it is not. In most areas of the country, water is deficient: we use much more than Mother Nature can replace with her tears.

But this isn't how it should be. Nor is it how the situation *can* be. Sometimes as much as 40 or 50 percent of the water we use in landscaping and golf course irrigation is wasted. The problem is not how much we use, but how we use it.

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Is this too much to ask? I don't think so. A lot of people are refusing to accept the fact that a dwindling water supply is a *real* problem. It's time for those people to wake up and splash some cold water on their faces. The technology exists to create these systems. The management practices exist to implement them. It must be done.

We cannot sit back and wait for the problem to dry up. Because it will.

Jeff Sobul

Jeff Sobul, assistant editor

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NOR-AM

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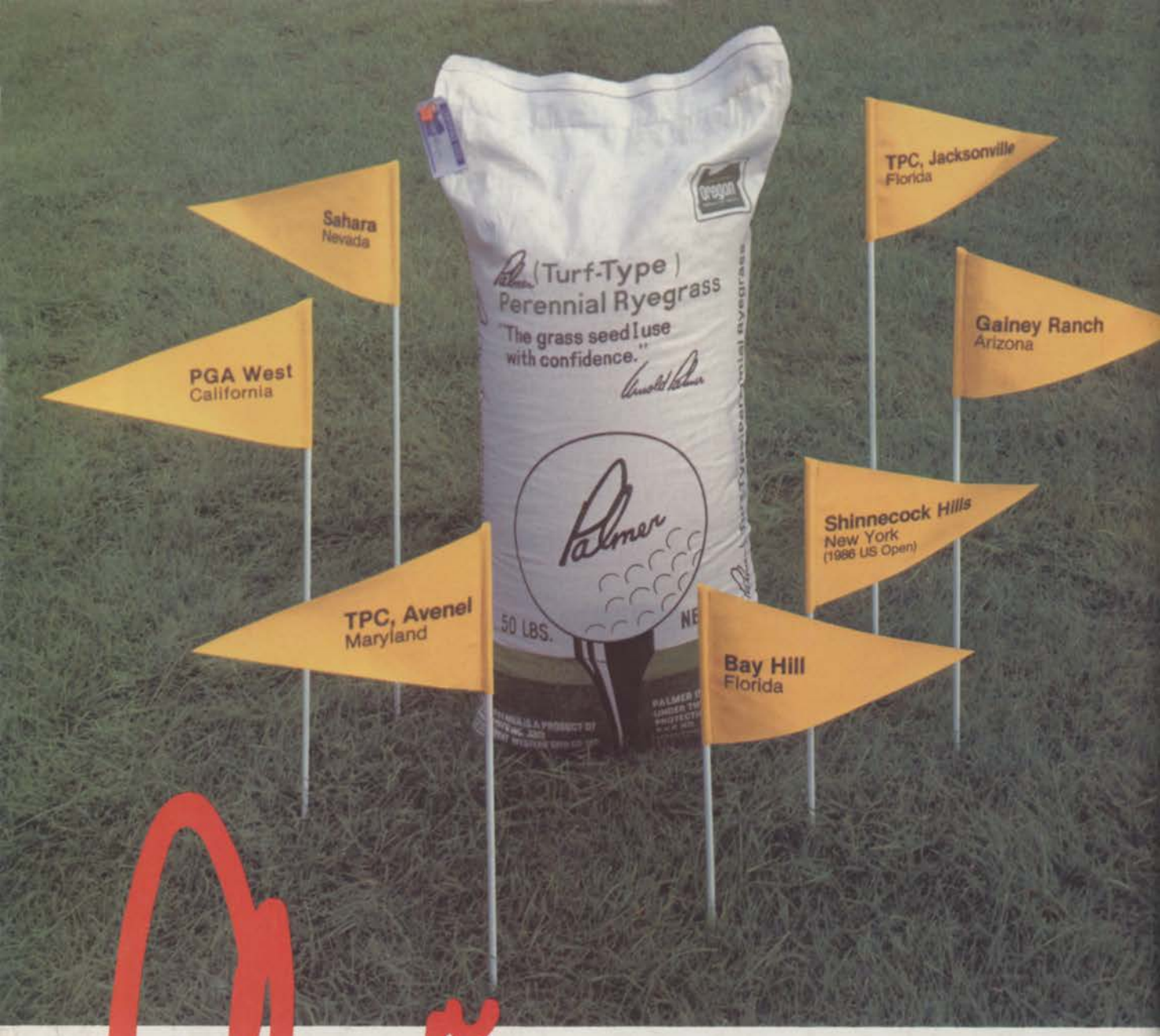

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